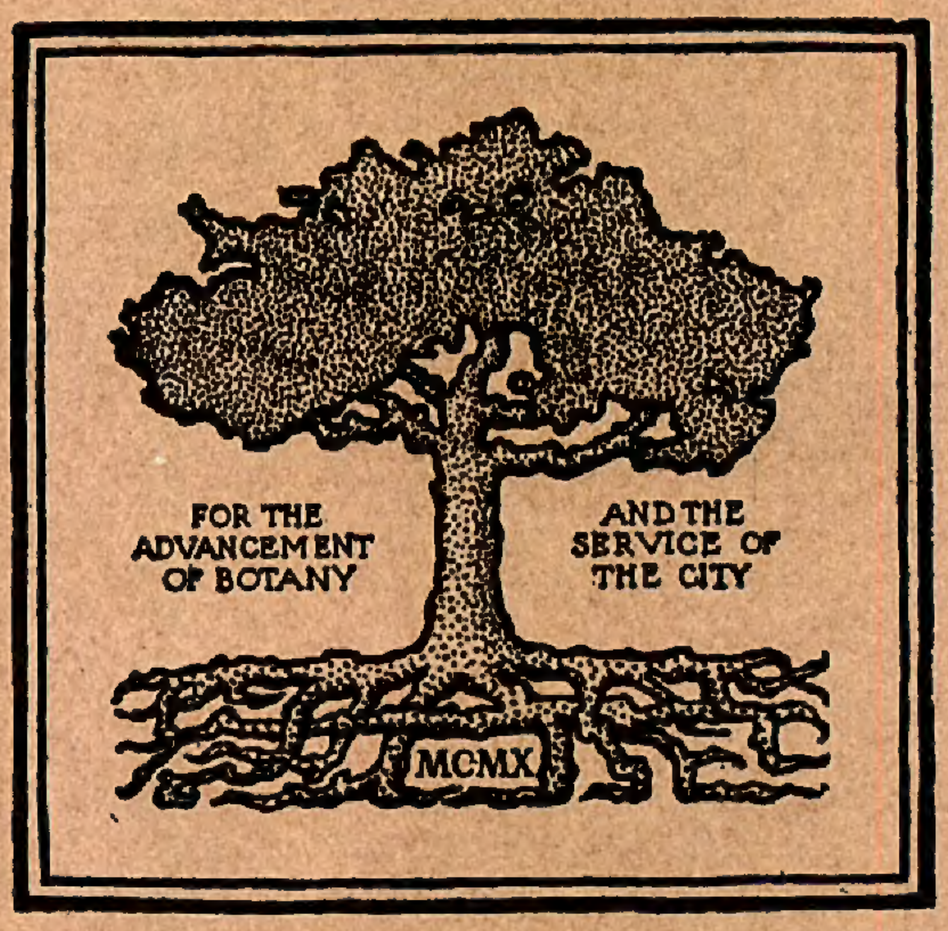
BROOKLYN BOTANIC GARDEN RECORD

VOL. XXIII JANUARY, 1934 NO. 1

DELECTUS SEMINUM

BROOKLYN

1933



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BROOKLYN
BOTANIC GARDEN
RECORD

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DELECTUS SEMINUM, BROOKLYN 1933

List of Seeds Offered in Exchange

These seeds, collected during 1933, are offered to botanic gardens and to other regular correspondents; also, in limited quantities, to members of the Brooklyn Botanic Garden. They are not offered for sale.

Applications for seeds must be received during January or February. **Latest date March 15, 1934.**

SEEDS OF HERBACEOUS PLANTS

Dicotyledones

Amarantaceae 79

Alternanthera
- Achyrantha R. Br .
- sessilis (L.) R. Br.
- spinosa L.

Amarantus
- caudatus L.
- caudatus var. albiflorus Hort.
- tricolor splendens

Celosia
- argentea var. Childsii (crimson)
- var. Childsii (yellow)
- var. chrysanthiflora
- var. "Glasgow Prize Crimson"
- var. Thompsonii

Froelichia
- gracilis Moq.

Apocynaceae 247

Apocynum
- *androsaemifolium L.

Araliaceae 227

Aralia
- *nudicaulis L.

* Seeds collected from wild plants.

Asclepiadaceae 248

Amsonia
Tabernaemontana Walt.
Asclepias
*incarnata L.
*tuberosa L.

Balsaminaceae 168

Impatiens
Balsamina L.
*biflora Walt.

Berberidaceae 93

Caulophyllum
*thalictroides Michx.
Podophyllum
*peltatum L.

Boraginaceae 252

Anchusa
azurea Rchb.
officinalis L.

Cactaceae 210

Opuntia
tortispina Engelm.
*vulgaris Mill.

Campanulaceae 276

Campanula
latifolia L. var. eriocarpa DC.
Platycodon
grandiflorum DC.

Capparidaceae 107

Cleome
serrulata Pursh
viscosa L.
Polanisia
trachysperma T. & G.

Caryophyllaceae 87

Arenaria
graminifolia Schrad.
Koriniana Fisch.
Cerastium
*arvense L. var. villosum Hollick & Brit.
Dianthus
Armeria L.
Lychnis
alba Mill.
Coronaria atropurpurea
Silene
ciliata Pourr.
japonica Rohrb.
latifolia Brit. & Rendle
maritima With.
orientalis splendens
*pennsylvanica Michx.
Tunica
Saxifraga Scop.

Chenopodiaceae 78

Beta
vulgaris L. var. Cicla Moq.
Roubieva
multifida Moq.

Cistaceae 193

Helianthemum
*canadense (L.) Michx.
guttatum Mill.
Hudsonia
*ericoides L.
*tomentosa Nutt.
Lechea
*Leggettii Brit. & Hollick
*villosa Ell.

Compositae 280

Anaphalis
*margaritacea Benth. & Hook.

Artemisia
Purshiana Bess.
Aster
*concolor L.
*depauperatus (Porter) Fernald
*divaricatus L.
*dumosus L.
*ericoides L.
*gracilis Nutt.
*laevis L.
*linariifolius L.
*macrophyllus L.
*novae-angliae L.
*paniculatus Lam.
*patens Ait.
*puniceus L.
*spectabilis Ait.
*subulatus Michx.
Bidens
*cernua L.
*coronata (L.) Fisch.
*laevis (L.) BSP.
Carlina
acaulis L.
Centaurea
Fritschii Hay.
Chrysanthemum
Parthenium "Golden Ball"
Parthenium "Silver Ball"
Chrysopsis
*falcata (Pursh) Ell.
*mariana (L.) Nutt.
Cirsium
*muticum Michx.
Coreopsis
grandiflora Hogg
lanceolata L.
palmata Nutt.
pubescens Ell.
Cosmos
diversifolius Otto
Dimorphotheca
pluvialis (L.) Moench
Echinops
sphaerocephalus L.
Erigeron
macranthus Nutt.
Eupatorium
*album L.
*hyssopifolium L.
*perfoliatum L.
*pubescens Muhl.
*purpureum L.
*resinosum Torr.
*rotundifolium L.
Gaillardia
pulchella Fouq.
pulchella var. picta Gray
Gymnolomia
multiflora (Nutt.) B. & H.
Helianthus
*angustifolius L.
*divaricatus L.
*giganteus L.
sparsifolius Hort.
Helichrysum
bracteatum (Vent.) Willd.
Heliopsis
helianthoides (L.) Sweet
helianthoides var. Pitcheriana Hort.
scabra var. zinniaeflora Hort.
Iva
*oraria Bartlett
Liatris
*graminifolia (Walt.) Willd.
*scariosa Willd.
*spicata (L.) Willd.
Mikania
*scandens (L.) Willd.
Pluchea
*camphorata (L.) DC.
Rudbeckia
laciniata L.
maxima Nutt.
speciosa Wend.
speciosa var. Sullivanti (Boynton & Beadle) Rob.

Sericocarpus
*asteroides (L.) BSP.
*linifolius (L.) BSP.
Silphium
laciniatum L.
perfoliatum L.
Solidago
*arguta Ait.
*asperula Desf.
*bicolor L.
canadensis L.
*Elliottii T. & G.
*graminifolia (L.) Salisb.
*neglecta T. & G.
*nemoralis Ait.
*odora Ait.
*patula Muhl.
*puberula Nutt.
*sempervirens L.
*speciosa Nutt.
*stricta Ait.
*tenuifolia Pursh
Stokesia
laevis Hill
laevis var. alba Hort.
Tagetes
erecta L.
lurida Cav.
Vernonia
*noveboracensis Willd.

Convolvulaceae 249

Pharbitis
hederacea Jacq.
sagittata Lam.
Quamoclit
pinnata Bojer

Cornaceae 229

Cornus
*canadensis L.

Cruciferae 105

Berteroa
incana (L.) DC.

Datiscaceae 207

Datisca
cannabina L.

Dipsacaceae 274

Dipsacus
sylvester Huds.

Droseraceae 112

Drosera
*longifolia L.
*rotundifolia L.

Ericaceae 233

Gaultheria
*procumbens L.

Gentianaceae 246

Gentiana
*crinita Froel.
*Saponaria L.
straminea Maxim.
Nymphoides
peltatum (Gmel.) Brit. & Rendle
Sabatia
*Kennedyana Fern.

Geraniaceae 129

Geranium
*carolinianum L.
Endressii J. Gay

Hypericaceae 187

Ascyrum
*Stans Michx.
Hypericum
*adpressum Bart.
Ascyron L.
*ellipticum Hook.

Labiatae 254

Dracocephalum
nutans L.
Hedeoma
*pulegioides (L.) Pers.
Monarda
*punctata L.
stricta Wooton
Ocimum
Basilicum L.
Perilla
frutescens Brit. var. nankinensis Bailey
Phlomis
alpina Pall.
cashmeriana Royle
Physostegia
virginiana (L.) Benth.
Salvia
azurea Lam. var. grandiflora Benth.
jurissicii Kosan.
splendens Ker-Gawl.
Scutellaria
angustifolia Pursh
canescens Nutt.
Stachys
*hyssopifolia Michx.
Teucrium
Botrys L.
Trichostema
*dichotomum L.

Leguminosae 128

Amphicarpa
*monoica (L.) Ell.
*Pitcheri T. & G.
Baptisia
australis (L.) R. Br.
*tinctoria (L.) R. Br.
Cassia
*Chamaecrista L.
*nictitans L.
Clitoria
Ternatea L.
Desmanthus
illinoensis MacM.
Lathyrus
*maritimus (L.) Bigel.
Mimosa
pudica L.
Strophostyles
*helvola (L.) Brit.
Tephrosia
*virginiana (L.) Pers.

Loasaceae 206

Blumenbachia
Hieronymi Urb.

Lobeliaceae 276a

Lobelia
*cardinalis L.
*inflata L.

Lythraceae 216

Cuphea
lanceolata Ait.
procumbens Cav.

Malvaceae 175

Callirhoe
involucrata Gray
Hibiscus
militaris Cav.
Moscheutos L.
Moscheutos Hybrids
Trionum L.
Kitaibelia
vitifolia Willd.

Martyniaceae 260

Martynia
louisiana Mill.
lutea Lindl.

Melastomaceae 223

Rhexia
*virginica L.

Nymphaeaceae 88

Nymphozanthus
*advena (Ait.) Fernald

Onagraceae 224

Clarkia
elegans Douglas
Epilobium
*angustifolium L.
Lopezia
racemosa Cav.
Ludwigia
*sphaerocarpa Ell.
Oenothera
Drummondii Hook.
speciosa Nutt.

Orobanchaceae 261

Epifagus
*virginiana (L.) Bart.

Oxalidaceae 130

Oxalis
corniculata L.
stricta L.

Papaveraceae 104

Arctomecon
*californicum Torr. & Frem.
*Merriami Coville
Argemone
Barclayana Penny
intermedia Sweet
ochroleuca
Eschscholtzia
californica Cham.

Phytolaccaceae 83

Phytolacca
decandra L.

Plantaginaceae 269

Plantago
Psyllium L.

Polemoniaceae 250

Gilia
achilleaefolia Benth.
tricolor Benth.

Polygonaceae 77

Polygonella
*articulata (L.) Meisn.
Polygonum
*scandens L.

Portulacaceae 85

Portulaca
grandiflora Lindl.
marginata HBK.
Talinum
patens Willd.

Primulaceae 237

Lysimachia
*terrestris (L.) BSP.
Steironema
*ciliatum (L.) Raf.
*lanceolatum (Walt.) Gray
Trientalis
*americana (Pers.) Pursh

Pyrolaceae 231

Chimaphila
*umbellata (L.) Nutt.
Pyrola
*elliptica Nutt.

Ranunculaceae 91

Actaea
*alba (L.) Mill.
*rubra (Ait.) Willd.
Anemone
Halleri All.
Aquilegia
baikalensis Hort.
canadensis L.

chrysantha Gray
Skinneri Hook.
vulgaris L.
vulgaris var. nivea grandiflora Hort.
vulgaris var. olympica Baker

Clematis
ochroleuca Ait.
*virginiana L.

Coptis
*groenlandica (Oeder) Fern. (C. trifolia of auth.)

Paeonia
corallina Retz.

Thalictrum
aquilegifolium L.

Trollius
*laxus Salisb.

Rosaceae 126

Geum
japonicum Thunb.

Gillenia
trifoliata (L.) Moench

Potentilla
viscosa Don

Sanguisorba
*canadensis L.

Rubiaceae 270

Mitchella
*repens L.

Sarraceniaceae 110

Sarracenia
*purpurea L.

Saxifragaceae 117

Heuchera
macrorhiza Small

Parnassia
*caroliniana Michx.

Scrophulariaceae 257

Chelone
*glabra L.

Gerardia
*purpurea L.

Gratiola
*aurea Muhl.

Linaria
dalmatica Mill.
macedonica Griseb.

Melampyrum
*lineare Lam.

Pentstemon
barbatus Nutt. var. Torreyi Gray
diffusus Douglas
glaber Pursh
glaber var. alpinus Gray
*hirsutus Willd.

Rhinanthus
*Crista-galli L.

Scrophularia
*nodosa L.

Solanaceae 256

Capsicum
frutescens L.

Nicotiana
alata Link & Otto var. grandiflora Comes
Sanderae Sander
solanifolia Walp.
Tabacum L.

Solanum
dulcamara var. nanschanicum
Humboldtii Willd.
sodomaeum L.

Umbelliferae 228

Cicuta
*maculata L.

Coriandrum
sativum L.

Eryngium
amethystinum L.
Heracleum
platytaenium Boiss.
Osmorrhiza
*longistylis (Torr.) DC.
Sium
*cicutaefolium Schrank

Verbenaceae 253

Verbena
*hastata L.
venosa Gill. & Hook.

Violaceae 198

Viola
*affinis LeConte
*conspersa Reichenb.
*fimbriatula Sm.
*lanceolata L.
*latiuscula Greene
*pallens (Banks) Brainerd
*palmata L.
*primulifolia L.
*sagittata Ait.
*striata Ait.

Zygophyllaceae 135

Tribulus
terrestris L.

Monocotyledones

Amaryllidaceae 340

Zephyranthes
texana Herb.

Araceae 323

Arisaema
*triphyllum (L.) Schott
Peltandra
*virginica (L.) Kunth

Cyperaceae 320

Carex
Grayii Carey
*gynandra Schwein.
Cyperus
Houghtonii Torr.
Eriophorum
*virginicum L.

Eriocaulaceae 330

Eriocaulon
*compressum Lam.
*decangulare L.

Gramineae 319

Andropogon
*glomeratus (Walt.) BSP.
*scoparius Michx.
*virginicus L.
Glyceria
*obtusa (Muhl.) Trin.
Panicum
*virgatum L.
Phragmites
*communis Trin.

Haemodoraceae 339

Lachnanthes
*tinctoria (Walt.) Ell.
Lophiola
*aurea Ker.

Iridaceae 344

Sisyrinchium
*angustifolium Mill.
*atlanticum Bicknell

Juncaceae 336

Juncus
*effusus L. var. solutus Fern. & Wieg.

Liliaceae 338

Amianthium
*muscaetoxicum (Walt.) Gray
Asphodeline
lutea Reichb.
Clintonia
*borealis (Ait.) Raf.
Helonias
*bullata L.
Lilium
*superbum L.
Maianthemum
*canadense Desf.
Medeola
*virginiana L.
Oakesia
*sessilifolia (L.) Wats.
Polygonatum
*biflorum (Walt.) Ell.
*commutatum (R. & S.) Dietr.
Smilacina
*racemosa (L.) Desf.
*stellata (L.) Desf.
Streptopus
*roseus Michx.
Trillium
*erectum L.
*undulatum Willd.
Uvularia
*perfoliata L.
Xerophyllum
*asphodeloides (L.) Nutt.
Yucca
filamentosa L.

Orchidaceae 350

Calopogon
*pulchellus (Sw.) R. Br.
Corallorrhiza
*maculata Raf.
Cypripedium
*acaule Ait.
*parviflorum Salisb.
Epipactis
*pubescens (Willd.) A. A. Eaton
Habenaria
*bracteata (Willd.) R. Br.
*hyperborea (L.) R. Br.

Pontederiaceae 334

Pontederia
*cordata L.

Xyridaceae 329

Xyris
*caroliniana Walt.

SEEDS OF TREES AND SHRUBS

GYMNOSPERMAE

Pinaceae

Cedrus
Libani Loud.

ANGIOSPERMAE

Bombacaceae 177

Ochroma
Lagopus Swartz

Fagaceae 62

Nothofagus
†fusca Oerst.
†Menziesii Oerst.
†Solandri Oerst.
†truncata (Col.) Ckn.

Juglandaceae 60

Platycarya
strobilacea Sieb. & Zucc.

Lauraceae 102

Benzoin
*aestivale (L.) Nees

Leguminosae 128

Amorpha
*fruticosa L.
Cladrastis
platycarpa Mak.

Rosaceae 126

Spiraea
*tomentosa L.

SEEDS COLLECTED IN THE PINE BARRENS OF NEW JERSEY BY MR. T. WINDON

Arctostaphylos
*Uva-ursi (L.) Spreng.
Arenaria
*caroliniana Walt.
Breweria
*Pickeringii (M. A. Curtis) Gray
Calopogon
*pulchellus (Sw.) R. Br.
Chimaphila
*maculata (L.) Pursh
Cypripedium
*acaule Ait.
Drosera
*filiformis Raf.
Epipactis
*pubescens (Willd.) A. A. Eaton
Eriophorum
*virginicum L.
Gaultheria
*procumbens L.
Gentiana
*Andrewsii Griseb.
*Porphyrio J. F. Gmel
Habenaria
*blephariglottis (Willd.) Torr.
*clavellata (Michx.) Spreng.
Hudsonia
*ericoides L.
Leiophyllum
*buxifolium (Berg.) Ell.
Liatris
*spicata (L.) Willd.
Lobelia
*cardinalis L.
Lophiola
*aurea Ker.
Mitchella
*repens L.
Pogonia
*ophioglossoides (L.) Ker.
Polygala
*lutea L.

† New Zealand seeds, obtained by courtesy of the State Forest Service, Wellington, New Zealand.

Sabatia
*sp. (pink flrs.)
*lanceolata (Walt.) T. & G.
Sarracenia
*purpurea L.
Spiranthes
*cernua (L.) Richard
Xerophyllum
*asphodeloides (L.) Nutt.

Address requests for seeds before March 15 to

SEED EXCHANGE,
Brooklyn Botanic Garden,
1000 Washington Avenue,
Brooklyn, N. Y.,
U. S. A.

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GENERAL INFORMATION

Membership.—All persons who are interested in the objects and maintenance of the Brooklyn Botanic Garden are eligible to membership. Members enjoy special privileges. Annual Membership, $10 yearly; Sustaining Membership, $25 yearly; Life Membership, $500. Full information concerning membership may be had by addressing *The Director, Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, N. Y.* Telephone, Prospect 9-6173.

The Botanic Garden is open free to the public daily from 8 a.m. until dusk; on Sundays and Holidays it is open at 10 a.m.

Entrances.—On Flatbush Avenue, near Empire Boulevard and near Mt. Prospect Reservoir; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

The street entrance to the Laboratory Building is at 1000 Washington Avenue, opposite Crown Street.

To Assist Members and others in studying the collections the services of a docent may be obtained. This service is free of charge to *members of the Botanic Garden;* to others there is a charge of 50 cents per person. Arrangements must be made by application to the Curator of Public Instruction at least one day in advance. No parties of less than six adults will be conducted.

To Reach the Garden take Broadway (B.M.T.) Subway to Prospect Park Station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, or Tompkins Avenue trolleys to Washington Avenue; St. John's Place trolley to Sterling Place and Washington Avenue; Union Street or Vanderbilt Avenue trolleys to Prospect Park Plaza and Union Street. By Automobile from points on Long Island take Eastern Parkway west and turn left at Washington Avenue; from Manhattan, take Manhattan Bridge, follow Flatbush Avenue Extension and Flatbush Avenue to Eastern Parkway, turn left following Parkway to Washington Avenue; then turn right.

* Deceased, December 7, 1933.

BROOKLYN BOTANIC GARDEN
PUBLICATIONS

RECORD. Established, January, 1912. An administrative periodical issued quarterly (1912–1928); bimonthly (1929–1932); quarterly (1933–). Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, guides, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others $1.00 a year. Circulates in 59 countries.

MEMOIRS. Established, July, 1918. Published irregularly. Circulates in 47 countries.

Volume I. *Dedication Papers:* comprising 33 scientific papers presented at the dedication of the laboratory building and plant houses, April 19–21, 1917. 521 pages. Price $3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. By Norman Taylor, June 11, 1923. 108 pages. Price $1.00, plus postage.

Volume III. Vegetation of Mount Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor, June 10, 1927. 151 pages. Price $1.60.

CONTRIBUTIONS. Established, April 1, 1911. Papers originally published in periodicals, reissued as "separates," without change of paging, and numbered consecutively. Twenty-five numbers constitute one volume. Price 25 cents each, $5.00 a volume. Circulates in 34 countries.

63. Inheritance of resistance to loose and covered smut in a hybrid of Early Gothland and Victor oats. 10 pages. 1932.

64. Inheritance of resistance to loose and covered smut in hybrids of Hull-less with Early Gothland and Monarch oats. 28 pages. 1932.

65. Monographic studies in the genus Eleocharis—II. 34 pages. 1932.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each. Circulates in 28 countries.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication. Issued as numbers of the RECORD; see above.

Guide No. 5. The Rock Garden. 28 illustrations. Price, 35 cents. By mail, 40 cents.

Guide No. 6. Japanese potted trees (Hachinoki). 11 illustrations. Price, 35 cents. By mail, 40 cents.

Guide No. 7. The story of our boulders: Glacial geology of the Brooklyn Botanic Garden. 22 illustrations. Price, 35 cents. By mail, 40 cents.

Guide No. 8. The story of fossil plants. 8 illustrations. Price, 35 cents. By mail, 40 cents.

SEED LIST. (*Delectus Seminum*) Established, December, 1914. Since 1925 issued each year in the January number of the RECORD. Circulation includes 160 botanic gardens and institutions located in 40 countries.

AMERICAN JOURNAL OF BOTANY. Established, January, 1914. Published, in coöperation with the BOTANICAL SOCIETY OF AMERICA, monthly, except during August and September. Subscription, $7.00 a year. Circulates in 53 countries.

ECOLOGY. Established, January, 1920. Published quarterly in coöperation with the ECOLOGICAL SOCIETY OF AMERICA. Subscription, $4.00 a year. Circulates in 48 countries.

GENETICS. Established, January, 1916. Bimonthly. Subscription, $6.00 a year. Circulates in 37 countries.

BROOKLYN BOTANIC GARDEN RECORD

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CONTAINING THE

TWENTY-THIRD ANNUAL REPORT

OF THE

BROOKLYN BOTANIC GARDEN

1933

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BROOKLYN BOTANIC GARDEN

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SCIENTIFIC AND EDUCATIONAL

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THE BOTANIC GARDEN AND THE CITY

THE BROOKLYN BOTANIC GARDEN, established in 1910, is a Department of the Brooklyn Institute of Arts and Sciences. It is supported in part by municipal appropriations, and in part by private funds, including income from endowment, membership dues, and special contributions. Its articulation with the City is through the Department of Parks.

The City owns the land devoted to Garden purposes, builds, lights, and heats the buildings, and keeps them in repair, and includes in its annual tax budget an appropriation for other items of maintenance. One third of the cost of the present buildings (about $300,000) and of other permanent improvements (about $253,000) has been met from private funds.

Appointments to all positions are made by the director of the Garden, with the approval of the Botanic Garden Governing Committee, and all authorized expenditures for maintenance are made in the name of the private organization, from funds advanced by the Institute, which, in turn, is reimbursed from time to time by the City, within the limits, and according to the terms of the annual Tax Budget appropriation.

All plants have been purchased with private funds since the Garden was established. In addition to this, it has been the practice of the Garden, from its beginning, to purchase all books for the library, all specimens for the herbarium, all lantern slides and photographic material, and numerous other items, and to pay certain salaries, with private funds.

The needs of the Garden for private funds for all purposes, are more than twice as great as the present income from endowment, membership dues, and special contributions. The director of the Garden will be glad to give full information as to possible uses of such funds to any who may be interested.

INFORMATION CONCERNING MEMBERSHIP

The Brooklyn Institute of Arts and Sciences is organized in three main departments: 1. The Department of Education. 2. The Museums. 3. The Botanic Garden.

Any of the following seven classes of membership may be taken out through the Botanic Garden:

1.	Annual member	$ 10
2.	Sustaining member	25
3.	Life member	500
4.	Permanent member	2,500
5.	Donor	10,000
6.	Patron	25,000
7.	Benefactor	100,000

Sustaining members are annual members with full privileges in Departments one to three. Membership in classes two to seven carries full privileges in Departments one to three.

In addition to opportunities afforded to members of the Botanic Garden for public service through coöperating in its development, and helping to further its aims to advance and diffuse a knowledge and love of plants, to help preserve our native wild flowers, and to afford additional and much needed educational advantages in Brooklyn and Greater New York, members may also enjoy the privileges indicated on the following page.

Further information concerning membership may be had by addressing The Director, Brooklyn Botanic Garden, Brooklyn, N. Y., or by personal conference by appointment. Telephone, Prospect 9–6173.

PRIVILEGES OF MEMBERSHIP

1. Free admission to the buildings and grounds at all times.
2. Cards of admission for self and friends to all exhibitions and openings preceding the admission of the general public, and to receptions.
3. Services of docent (by appointment), for self and party (of not less than six), when visiting the Garden.
4. Admission of member and his or her immediate family to all lectures, field trips, and other scientific meetings under Garden auspices, at the Garden or elsewhere.
5. Free tuition in most courses of instruction; in other courses members are allowed a liberal discount from the fee charged to non-members.
6. Invitations for self and friends to spring and fall "Flower Days."
7. Copies of Garden publications, as follows:

    a. Record.
    b. Guides.
    c. Leaflets.
    d. Contributions.

8. Frequent Announcement Cards concerning plants in flower and other exhibits.
9. Privileges of the Library and Herbarium.
10. Expert advice on the choice and care of ornamental trees, shrubs, and herbaceous plants, indoors and out, on planting the home grounds, the care of lawns, and the treatment of plants affected by insect and fungous pests.
11. Determination of botanical specimens.
12. Participation in the periodical distribution of surplus plant material and seeds, in accordance with special announcements sent to members from time to time.

FORMS OF BEQUEST TO THE BROOKLYN BOTANIC GARDEN

Form of Bequest for General Purposes

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, the income from which said sum to be used for the educational and scientific work of the Brooklyn Botanic Garden.

Form of Bequest for a Curatorship

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, as an endowment for a curatorship in the Brooklyn Botanic Garden, the income from which sum to be used each year towards the payment of the salary of a curator in said Botanic Garden, to be known as the (here may be inserted the name of the donor or other person) curatorship.

Form of Bequest for a Fellowship

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, the income from which sum to be used in the payment of a fellowship for advanced botanical investigation in the Brooklyn Botanic Garden, to be known as the .....fellowship.

Form of Bequest for other particular purposes designated by the testator

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, to be used (or the income from which to be used) for the Brooklyn Botanic Garden *

.....

.....

* The following additional purposes are suggested for which endowment is needed:

1. Botanical research.
2. Publishing the results of botanical investigations.
3. Popular botanical publication.
4. The endowment of a lectureship, or a lecture course.
5. Botanical illustrations for publications and lectures.
6. The purchase and collecting of plants.
7. The beautifying of the grounds.
8. The purchase of publications for the library.
9. Extending and enriching our work of public education.
10. The establishing of prizes to be awarded by the Brooklyn Botanic Garden for botanical research, or for superior excellence of botanical work in the High Schools of the City of New York.

FIG. 1. North Addition. Perspective of the landscape architect's plan for the development of this area as a Horticultural Section. (8558.)

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REPORT OF THE DIRECTOR

TO THE BOTANIC GARDEN GOVERNING COMMITTEE:

I have the honor to present the following report for the year 1933.

LONG VIEWS AND SHORT VIEWS

"The cycles of trade depression which afflict the world," says Whitehead, "warn us that business relations are infected through and through with the disease of short-sighted motives."

Success in business means attainment; the reward of effort is apt to be not so much the joy of endeavor, but the thing attained. The main ideal is near enough at hand to be realized. This is why so many writers have appraised the business man as short-sighted.

Thus Galsworthy: "Our modern castle in Spain is, in one word: 'Production' . . . we are not forunate enough in civic life to have leaders who were born seeing two inches before their noses. . . . Our civilization, if it is to endure, must have a star on which to fix its eyes—something distant and magnetic to draw it on beyond the troubled needs and prejudices of the moment."

And then he refers to the builders of Seville Cathedral, who said, "Let us build a church so great that those who come after us may think us mad to have attempted it." To complete the church took 150 years.

Undoubtedly Galsworthy's "two inches" are an unjust exaggeration. Many business men are idealists. The world is dotted with scientific, educational, and charitable institutions which are monuments to business men of that type—James Smithson, Stephen Girard, Peter Cooper, Matthew Vassar, Ezra Cornell, Cecil Rhodes, Andrew Bernhard Nobel, Andrew Carnegie, Marshall Field, Edwin Gould, Alfred T. White, not to mention those still living. These names are recalled only as outstanding types of a class. Other business men have invested in securities, but have lacked the long vision which enabled them to see that the greatest safety, the largest returns, and the deepest satisfactions of life are to be had by investing in those institutions which yield returns to others and contribute to the advancement of science and art, education, and civilization.

A Botanic Garden is such an institution. Whatever measure of success may have attended the efforts of this one, is recorded in the twenty-two Annual Reports that have preceded. The importance of the "long view" as well as the large view has already been emphasized in some of these reports. It needs to be kept constantly in mind and to be restated from time to time. Why should the builders of a botanic garden be less ambitious than the builders of the Seville Cathedral? We have not half realized what it would mean to Brooklyn, to civic advancement in general, to education and science and art, to develop our fifty acres of plantations to such a perfection of beauty, and our scientific and educational program to such high standards of accomplishment "that those who come after us may think us mad to have attempted it." What a wonderful and unusual opportunity is here presented for private philanthropy.

We must not lose sight of the substantial accomplishment of the past twenty-three years; to do so would spell discouragement. We do not fail to remember generous benefactions and the sustained and active interest and the moral support which have accompanied them; to do that would be most ungenerous and forgetful. But, what is still more important, we must not be unmindful of what has not been accomplished, of how far short we have come of the ideal of accomplishment; to do this would be to lose a most effective stimulus to continued endeavor.

The short view reveals an institution of modest means, limited area, and limited possibilities. The danger consists in considering the *status quo* as final, and the needs *therefore* correspondingly small.

The long view reveals the ideal of an institution to be realized by gradual, steady progress. Not such an ideal that our *contemporaries* will think us mad to attempt it, but such an ideal as will stimulate united endeavor to approach it as rapidly as possible, and will compel the approval, as well as the commendation, of those who come after us.

Nothing could be more disastrous to an institution than to adopt the attitude, held, alas, by some, that needs are determined by size—that because it is small its requirements must eternally be small. To do this is to be indifferent to the essential element of quality—to see two inches before one's nose, rather than to visualize an ideal.

Depression and Morale

Social workers and those engaged in relief work during the depression have reported that food and fuel and wherewithal to be clothed are not the only urgent needs of the unemployed. The depression is not only economic; it tends to become mental and spiritual. Loss of morale needs to be steadily counteracted; it tends to persist and to result in permanent social maladjustment. The results are disastrous in proportion to one's lack of intellectual and cultural resources. While music and art, literature and science, cannot appease hunger, they do minister to fundamental human needs, and their ministrations become increasingly urgent in adversity.

It is specially important, therefore, in periods of unemployment and depression that institutions which meet these needs should not be forced to retrench their activities too greatly. That nearly one hundred and ten thousand persons have come to the Brooklyn Botanic Garden every month during 1933 to enjoy and study the collections, to use its library, to attend its classes and lectures, bears testimony to the fact that the Garden is meeting fundamental human needs, aesthetic, intellectual, and cultural, on a scale that is truly impressive. Of course, it cannot continue to do this adequately with diminished appropriations and contributions.

A writer in the *Survey Graphic* for December, 1933, has described how one family has met the depression. With a reduction in salary of 80 per cent. (from $100 to $20 a week), he writes, "No victim of the present conditions need be mentally depressed so long as he has access to books, and a garden to work in. What is more satisfying, more soul inspiring, than to prepare the soil, plant the seed, and watch the unfolding of leaf and bud."

But one cannot become genuinely interested in gardening without becoming interested in gardens and in plants. The inspection of other gardens gives one suggestions to apply in his own. It may, indeed, if he only follows the leads, take him to books and ideas concerning the history of gardening; and along that thread he may follow the fascinating story of civilization from its dawn to the present.

A more or less superficial and sketchy knowledge of plants no longer suffices; one feels the need of knowing a larger number of kinds—trees, shrubs, and herbaceous plants, and, in many cases, one finds himself wanting to know their horticultural or botanical as well as their common names, something of their relationships—the plant family to which they belong—the country of their origin, and the cultural conditions they require. If a botanic garden is accessible, it is easy to gratify these interests, and to deepen and broaden them. This, in fact, is one of the services which the Brooklyn Botanic Garden renders to its community. And not only to those in its more immediate community, but to those within commuting distance. Thus we find ourselves a center of interest and pilgrimage and correspondence with an ever increasing number from all of Long Island, from every borough of Greater New York, from Westchester County, and from suburban New Jersey —including persons who, particularly in this period of economic depression, have turned instinctively to gardening and plant life and found themselves not disappointed.

Non Acta Sed Agenda

It will, perhaps, seem to the readers of this report that its first paragraphs should record the fact that, even in a period of universal economic disaster, some progress has been made. It would be easy to do this; but the future welfare of an institution is pro-

moted, not by dwelling with smug satisfaction on what has been accomplished, but on what remains to be accomplished—on what *ought* to be done. Moreover, the only safe satisfaction of an executive is not in past achievements, but in plans for the future and in the very process of bringing things to pass. The following pages will contain the record of progress for the year 1933. If it is presented in such a way as to produce in the minds of officials and contributors a feeling of satisfaction, instead of incentive and inspiration, it will have wholly failed in its purpose.

A Word of Appreciation

This report should not proceed far without recording the very genuine appreciation of the director and staff of all that has been done and contributed of time, effort, enthusiasm, interest, and money to carry the Garden over a period of stress and strain—to save it from suffering as much as it might easily have suffered during the collapse of the economic set-up of the world, to ease and thereby to share the burdens of administration. This appreciation finds its most substantial expression in the fact that the staff itself, in common with the staffs of other similar institutions, has accepted reductions in personal salary and departmental budgets without complaint and with no diminution of loyalty to the Garden.

The president of the Board and the chairman and members of the Governing Committee have given every possible evidence of confidence and moral support.

The Woman's Auxiliary

No institution ever had a more active or enthusiastic body of supporters than the Botanic Garden has in its Woman's Auxiliary. Its chairman and every other officer and member have spared neither time nor effort to help save the Garden from defeat by the discouragement of adverse circumstances during the past two years. As a result of these efforts, the circle of friends intelligently interested in the Garden has been greatly extended, the net loss of Garden membership has been greatly reduced, and the raising by subscription from the small Auxiliary membership of the sum of more than $1500, and by a public lecture of $735.00

FIG. 2. Exhibition of plant forms in ornament, at the Metropolitan Museum of Art, New York City. (Metropolitan Museum negative MM6363g.)

for unemployment relief at the Garden was in reality a triumph of optimism and persistence, especially at a time when every one was being deluged with appeals for contributions to very worthy causes. We expect hospitals and economic distress to make a compelling appeal (as they should), but to appreciate the civic and cultural importance of the activities of a botanic garden and to rise to the occasion with the zeal of this Auxiliary is to reach a new level of understanding of what things are important in a civilization like ours.

And last, but by no means least, I wish to record here, on behalf of the director and staff, an appreciation which is beyond all words of adequate expression, for the more than generous contributions of funds by three staunch friends. Without these contributions, it would have been necessary to suspend indefinitely a large and important part of our work. The contributions were made possible only by definite personal economies, and this fact is not lost sight of. Our only regret is that these benefactors wish to remain anonymous.

The Work Before Us

And now, to use a Hibernianism, let us postpone the past for another page or two, and try to get an outline of the picture which lures us on.

Entrance Gates.—Is it not really a cause for concern that an institution 23 years of age has a suitable gate at only one of its five main entrances? We all know why. It is through no fault of the Botanic Garden authorities. But should not this situation now become a matter of active consideration? These gates are among the permanent improvements which we may properly look to the City to finance. They also afford attractive opportunities for private benefactions. The architect's designs for them were published in the Botanic Garden Record for May, 1930. Since that publication appeared, one of the gates—the *Richard Young Gate* (at Flatbush Ave. and Empire Boulevard)—has been built, as a gift from Mr. Young. The director will be glad to give full information concerning the other gates to anyone who may be interested. The appeal here is not only to an interest in the Botanic Garden, but to an interest in making Brooklyn a more beautiful borough.

The North Addition.—This tract of nearly four acres of land at the north end of the Garden, between Brooklyn Museum and Mt. Prospect Reservoir, has a frontage on Eastern Parkway. The Eastern Parkway gate will become the main entrance to the Garden as soon as it is built. The design for landscaping the North Addition has been prepared by Mr. Caparn, and is shown in perspective as the frontispiece of this Report. The plans were approved by the Art Commission of the City of New York and the contract was advertised for public letting. Bids were opened on September 22, 1932, but the lowest bid was $975.50 in excess of the amount appropriated by the City. Before the matter could be adjusted, it became necessary for the City to cancel all appropriations for permanent improvements for which contracts had not been let.

Appeal to CWA.—In December, 1933, application was made to the Federal Civil Works Administration (CWA) for funds for this purpose. Preliminary approval was given before the end of the year, and it is anticipated that work on this improvement will begin early in 1934.* Plans for the three entrance gates were also laid before the CWA.

Maintenance of Grounds.—The history of public parks and gardens in the United States has, in general, been characterized by fairly generous provision of land and quite inadequate provision for proper maintenance. The latter is due to a number of factors, but the underlying cause is the lack of sufficiently high ideals of maintenance, or a willing subordination of such ideals to other, and often unworthy, considerations. For any close approximation to perfection of maintenance one must look to private estates. But, if due allowance be made for the wear and tear by hundreds of thousands of visitors a month, there is no valid reason why a public garden may not be kept in as perfect a state of maintenance as a private one. In fact, there is every reason why it should be.

"Yes," is the prompt reply, "but this requires money."

"True," is the answer, "but the fundamental need is the wish.

* Since the above report was written, the North Addition project has been approved and funds provided by the CWA. Work began on February 5 with 15 men under the supervision of Mr. Caparn. There was then about one foot of snow on the ground and the soil was frozen to the depth of six or eight inches.

and the will, and the proper ideals on the part of those responsible for providing the funds."

Doubtless, a small garden, other things being equal, does need a smaller sum for maintenance than a large garden. But the actual amount required depends upon the standard of perfection adopted. This is a truism; but it is one of the truisms that is not in danger of being stated too often.

Perhaps it will not seem pleonastic to emphasize again in this report—as was done in the last one—the valuable public service the Brooklyn Botanic Garden could render by maintaining its grounds at the standard of perfection of some of our beautiful private estates. To do this would really not require excessive nor extravagant annual appropriations. The ideal has not been wanting on the part of the administration, but the appropriations so far have been quite inadequate for a very close approximation to this ideal, although newspaper editorials have referred to the Garden as the most beautiful spot in Greater New York.

It requires no argument to make it clear that five gardeners are quite inadequate to maintain properly more than 40 acres, not of park, but of intensively planted garden, including highly specialized collections such as the rock garden, rose garden, local flora and general systematic sections, Japanese garden, and other collections requiring expert knowledge and experience. Unskilled per diem labor is not adequate for such work.

Scientific and Educational Work.—"For the advancement of botanical science and knowledge, and for the prosecution of original researches therein and in kindred subjects." This is the real object for which the Brooklyn Botanic Garden was founded, as stated in the Act of the State Legislature authorizing its establishment. It is to assist in the realization of this aim that the grounds are laid out and maintained as a "botanic garden." It is a scientific and educational institution, not merely a fifty-acre park, which has been committed to our care. For an effective program of education and research, we are quite under-financed. Without endeavoring to record all the facts in support of this statement we may note that, for example, we now have one curator less than we had four years ago. And yet there is urgent need of the services of at least two more curators, together with curatorial as-

sistants, to provide for a more efficient administration of our collections for educational ends, and for scientific investigation and the work of public instruction.

The normal, rapid expansion of our work during the past few years, and the steadily increasing demands for public service are the most convincing evidence of our need for a larger personnel and income.

There are indications that we have seen the worst of the world-wide economic depression, and we should be ready with plans to take prompt and full advantage of every opportunity that will arise during the progress of recovery, looking toward an ever-widening and more efficient public service.

Public Relations

Attendance.—"Is this a bread line?", a gentleman asked. He was referring to the double queue (two abreast) extending one Sunday morning in May for about 25 feet out onto the sidewalk from the entrance turnstile of the Richard Young Gate. "No," was the reply, "these people have come to enjoy the plantations of the Brooklyn Botanic Garden." The double line continued for fully two hours, new arrivals taking their place at the end as fast as those in front could pass through the turnstile. There was a similar queue at the north Washington Avenue gate. The total attendance that Sunday was nearly 30,000. Similar queues formed on several pleasant Sundays in the spring and fall.

The total attendance for 1933 was 1,315,847 as compared to 1,307,964 in 1932 and 1,107,039 in 1931.

Mere Figures Not Interesting.—But the Botanic Garden is not interested in crowds *per se*. What we are interested in is to have the Garden used for the purposes for which it was established, namely, to stimulate and to gratify an interest in plant life—to promote public education in all aspects of botany and horticulture. The plantations are intended to serve as an outdoor museum; their use as a playground (for children or adults), and their use merely as a public park, tends to defeat their use as a botanic garden and is not encouraged. A park of several hundred acres, intended primarily for recreation, is available just across the street from the Botanic Garden, so that there is no necessity or excuse for the use

of the Botanic Garden merely as a park or playground. Our restriction, so far as possible, of the use of our plantations for botanic garden ends is appreciated by thousands who come here for that purpose.

Bureau of Public Information.—This service has now become world-wide. Requests are continually being received for information on all aspects of plant life and horticulture—technical, economic, and popular—from individuals, institutions, corporations, and national governments. The service is not wholly a one-sided one, for these contacts frequently result in the enrichment of our library, herbarium, or collections of living plants. Much of the time of the library staff is absorbed in supplying citations to literature and other information, but all departments are involved, especially the horticulturist and members of the department of plants. The horticulturist reports (p. 92) that during 1933 he has received and answered 746 requests for information, involving the writing of 242 letters in addition to replies given in person and by telephone. (Cf. p. 102.) The library replied to more than 500 requests. On conservative estimate the Garden received and answered during the year not less than 1,500 inquiries.

Research

It is a fact that, in times of financial stress, appropriations for research are apt to be the first to be reduced. Lack of knowledge is one of the major causes of the world's ills, but when the world goes on the rocks of financial disaster, it helps to economize by withdrawing support from those activities whose object is the increase of knowledge and the spread of enlightenment. In more than one country during the past two or three years, appropriations for research have been the first to be reduced or have been reduced most drastically. How few people realize that from the dawn of civilization to the present year, scientific research has, at every step of the way, been one of the driving forces of progress.

Not a person living passes a day of his life without becoming a debtor to botanical research.

But the results of research have not only been knowledge. The application of that knowledge has been the foundation of wealth; the lack of it, economic distress. The American Chemical Society

has recently made public a statement of Dr. Mehring, of the U. S. Department of Agriculture, that, if research in the control of plant diseases should cease, the United States would be facing famine within ten years or less. *Science Service* recently noted that, "Taxes on farm products, heavier than any legislative body would even dare levy, are assessed every year by plant diseases." The principal diseases of Indian corn caused a loss of 10.3 per cent. of the crop (2,839,959,000 bushels) in 1928; 8.5 per cent. in 1929; 7.6 per cent. in 1930. Cotton diseases caused a loss of more than 17 per cent. of the crop (14,373,000 bales) in 1928. Wheat, the third big-money crop when prices are normal, was taxed by its main fungus enemies to the extent of 7.8, 8.2, and 5.7 per cent., respectively, of its total yields during the three-year period. The loss ran between eight and nine hundred millions of bushels. Great as they were, these losses would have been much larger were it not for the practical application of the results of research in plant pathology. An article in the *Scientific Monthly* for October, 1933, records the fact that during the past 19 years the life of telephone poles has been doubled by applying the results of timber disease studies, and that the loss from decay of fruits and vegetables in transit has been reduced from $96,000,000 in 1921 and $48,000,000 (in round figures) in 1922 to less than $26,000,000 in 1931. In other words, the saving of loss in this one item alone, of fruits and vegetables in transit, $22,000,000 from 1922 to 1931, is more than one third the total amount ($60,000,000) that may be withdrawn from the United States Treasury by the entire Federal Department of Agriculture during 1934, as announced June 19, 1933; it is more than four times the total appropriation for the U. S. Bureau of Plant Industry ($5,839,000) for 1932, which has been reduced to $3,728,000 (withdrawal figure) for 1934. If these savings could become available for the various governmental and private agencies engaged in plant disease research, it would not be necessary to abandon important projects, in which hundreds of thousands of dollars have already been invested for equipment and operation, and to add those engaged in this research to the crowded ranks of the unemployed. But, obviously, we are not living in Utopia. The statistics here cited also emphasize the fact that, notwithstanding the numerous existing

research organizations and foundations, there is still very inadequate financial provision for botanical research.

The year's activity in the modest program of research at the Brooklyn Botanic Garden is briefly recorded on pages 54–75. As is commonly the case in research, the work already accomplished has not only extended our knowledge, but has uncovered important new problems to be solved.

This work is still on the insecure financial basis of annual contributions of funds. In a previous report (for 1930) we commented on the expressed opinion of a well-known philanthropist to the effect that each generation should be expected to provide the funds for the educational and scientific work of its own day. But when we see a great national government (the United States) cancelling ten millions of dollars of appropriations for scientific research, thus throwing hundreds of efficient scientific men out of employment, with the consequent lying idle of expensive plant and equipment and the abandonment of important projects, and, at the same time, appropriating hundreds of millions of dollars for projects undertaken primarily to give employment; and when we think what the result would be if our endowed institutions for research in medicine, chemistry, physics, biology, and other branches of science were *now* dependent on the contributions of their generous, but more or less impoverished, contemporaries, we realize, as we could hardly have done four years ago, how essential it is for the indispensable work of research and education to be made secure by permanent endowment funds.

It was the hope and the expressed anticipation of Mr. Alfred T. White, when he provided for the first research curatorship at the Botanic Garden for a limited term of years, that the work would ultimately be permanently provided for by an endowment by one of the existing foundations. As yet, however, this hope has not been fulfilled.

Registered Investigators are listed on page 63, together with statements of their problems. Part of these investigators are registered in various universities as candidates for an advanced degree, while others have attained the doctorate or the master's degree.

FIG. 3. International Flower Show. Exhibit of Brooklyn Botanic Garden, 1933. Illustrating methods of plant propagation. General view. Gold medal award of Garden Club of America. Cf. Fig. 4. (Herbert Photos, 1738–1.)

Cooperation with Other Institutions and Organizations

In the Annual Report for 1925 we published a list of 840 institutions with which this Garden was in active cooperation that year. The number has not diminished. The following for 1933 are mentioned to illustrate the variety and scope of this cooperation:

1. *Metropolitan Museum of Art.*—On May 8, the Metropolitan Museum of Art opened a special exhibit to illustrate the use of plants as sources of design, the Brooklyn Botanic Garden, the New York Botanical Garden, the New York Public Library, and the New York Aquarium cooperating. This proved to be an interesting and instructive exhibit, but it entailed a very great amount of work. As the horticulturist has reported, the Brooklyn Botanic Garden sent growing plants weekly or oftener to the total number of 570, besides 41 bunches of cut flowers and branches.

In connection with the exhibit, the Museum held, from June 1 to 30, an exhibition of the work of students in New York High Schools and Schools of Design, with studies based upon plant forms. Considerable use was made of the Botanic Garden plantations and library by art students in preparation for this exhibit. The main exhibit continued open until September 10. The estimated attendance was 90,000.

The Merchants' Association of New York.—Since 1922 the director has been a member of the Committee on Plant Quarantines and Their Administration, and on September 26, 1933, accepted the chairmanship of the Committee, succeeding Mr. John H. Love, the first chairman, who resigned. This Committee, organized in 1922, is concerned primarily with the interests of commercial horticulturists—growers, importers, wholesalers, and retailers—as affected by the administration of the Federal Plant Quarantine Law, known as Quarantine 37.

Horticultural Society of New York.—Since 1928, the director of the Garden has served as a member of the board of directors of the Horticultural Society of New York.

During the year Dr. Svenson, of the Garden staff, gave a course of instruction, consisting of twelve sessions, under the auspices of the Society, and on November 13 commenced a repetition of this course. These courses have been largely attended and very popular.

The Garden has kept the Wardian case in the library of the Society supplied with potted plants, and has made three exhibits at the monthly meetings of the Society, as reported by the Horticulturist on page 92.

The International Flower Show is held each year in March in the Grand Central Palace, under the joint auspices of the Horticultural Society of New York and The New York Florists Club. Since 1932, the director of the Garden has been one of the Society's representatives on the Flower Show Committee.

Special attention is directed to the Horticulturist's report of our two exhibits at the 1933 show (March 20–25), for one of which, illustrating nearly every known method of plant propagation, we received the Gold Medal of the Garden Club of America, and for the other, an exhibit of about forty species and varieties of Crocus, we received a silver medal. The exhibits were planned and prepared by our Horticulturist, Mr. Free, and were installed under his supervision. The *Bulletin* of the Garden Club of America commented on the main exhibit as follows:

"The Brooklyn Botanic Garden's 'Methods of Plant Propagation' was the outstanding exhibit of the 1933 show. For inspiration and true horticultural interest nothing could touch it, and it thrilled everyone who saw it, from the horticulturist to the wondering city-dweller who knew little of the processes of plants. The gold medal of the Garden Club of America was awarded quickly and unanimously to this outstanding exhibit."

The *Gardeners' Chronicle of America*, for May, 1933, carried an article on the Flower Show which contained the following paragraph:

"I have been asked to mention a few features. . . . First, to my mind, comes the propagating exhibition as a basis of all gardening efforts, displayed by the Brooklyn Botanic Garden. It was something more than stimulating knowledge and interest; it also demonstrated thoroughly that a botanical garden can be intensely practical as well as entertaining."

The following quotations are from two of the many letters of commendation received:

"Made a vivid impression on everyone . . . outstanding, comprehensive, and educational."

"It was the finest and most informative exhibit of its kind I have ever seen, and you certainly deserve the profound thanks of the many people who are interested in this subject."

Concerning the Crocus exhibit, the firm of J. J. Grullemans & Sons, Bulb Growers, Lisse, Holland, commented as follows: "Your exhibit of crocus species was very attractive. We have never seen anything like this in America."

Our exhibit was crowded with visitors daily throughout the entire week. The total attendance at the Flower Show was approximately 130,000. The majority of these viewed the Brooklyn Botanic Garden exhibits. Members of our Woman's Auxiliary rendered invaluable service by being in daily attendance at the booth. Newspaper clippings have been received of 41 news items concerning this exhibit. It also received generous mention in various horticultural publications.

American Iris Society.—Cooperation with this Society, begun in 1920, in the test garden for Japanese Iris, has continued during 1933. The Iris project is in charge of Dr. George M. Reed, curator of plant pathology.

Century of Progress Exposition (Chicago).—The director of the Garden was a member of the sub-committee on science exhibits of this Exposition, and during the summer the Garden exhibited in the Horticultural Section a set of 85 paintings from its growing collection of water-color illustrations of Iris, made by Miss Maud Purdy and Miss Louise Mansfield, Botanic Garden artists, in connection with our Iris projects.

United States Government.—Steps are being taken in Washington to reorganize and relocate the United States Botanic Garden, and during the year, by request, the director has been in consultation with a representative of Congress on this matter.

Sixth International Congress of Genetics.—This Congress was held in Ithaca, N. Y., in the summer of 1932. The publication of the *Proceedings* of the Congress was in charge of the business management of *Genetics*, which is published by the Garden. Volume II of the *Proceedings* was issued at the time of the Congress, and Volume I appeared during 1933.

American Nature Study Society.—Our curator of elementary instruction, Miss Ellen Eddy Shaw, has been a director of this

Society during the year. At the annual meeting in Cambridge, Mass., December 26–30, papers were given by the director on aspects of adult education, and by Miss Jenkins, instructor, on "By-products of a Children's Garden," based on the work in our own Garden.

Miscellaneous.—As in preceding years, there has been almost continuous cooperation throughout the year with other botanic gardens, numerous garden clubs, various colleges and universities, city departments, the public and high schools of this and other cities, and private commercial concerns.

Cooperation has also continued for the 20th year with the Botanical Society of America in the publication of *American Journal of Botany,* now in its 20th volume; the Ecological Society of America for the 14th year in the publication of *Ecology,* now in its 14th volume; and with the Editorial Board of Genetics, for the 15th year, in the publication of *Genetics,* now in its 19th volume. Reports on these journals may be found in Appendix 8, page 152.

The Commission on International Justice and Goodwill of the Brooklyn Church and Mission Federation, holds annual exercises on Memorial Day in honor of some "Peace Hero." This year (May 30), the hero chosen was Mr. Alfred T. White, the "father" of the Garden. Rain made it necessary to transfer the exercises from the Alfred T. White Memorial Tablet, on the shore of the lake, to the rotunda of the Laboratory Building. The Rev. John C. Walker, minister of the Congregational Church of the Pilgrims, was chairman, and the speakers were the Rev. L. Bradford Young, assistant rector of Holy Trinity Protestant Episcopal Church, who placed a wreath in memory of Mr. White; Mr. Guy Du Val, a business associate of Mr. White and member of the Garden; Mrs. Henry A. Ingraham, president of the Brooklyn Y. W. C. A., and a member of our Woman's Auxiliary; and Rev. Edward J. Manning, assistant minister of the Unitarian Church of the Saviour, of which Mr. White was a member.

Cooperation with Relief Agencies

During 1933, the Emergency Work and Relief Bureau of the Emergency Unemployment Relief Committee placed a total of 54

unemployed men and women at the Garden. Of these, 22 were women, as many as 19 being employed at one time in the library, herbarium, photographic department, business office, and seed-room, and at stenographic and other work.

Of the men, five had "inside" work, drafting, janitorial assistance, and herbarium and library work, including repair of bindings, and translating.

Of 27 men having "outside" work, six were placed directly by the Work Bureau, and 21 by the Brooklyn Bureau of Charities, but the wages of the latter were paid from Emergency Unemployment Relief funds. In addition, there were 23 men placed and paid directly by the Bureau of Charities. One man was placed for three months by the Association for Improving the Condition of the Poor. This makes a total of 78 unemployed men and women placed at the Garden by all agencies during the year.

Citizens Family Welfare Committee.—On December 13, Mr. Paul Franklin, representing this Committee, presented before our entire personnel their plan for contributions by employees of the City educational institutions. As a result 39 persons pledged one per cent. or more of their salaries for three months as a contribution to the relief fund. These contributions will be received and transmitted to the Welfare Committee by our Business Office. The total amount pledged was $262.51.

Public Education

Education for All.—In ancient Greece and Rome the leisure of cultivated men was made possible by the labor of slaves. In our times, leisure for the masses is made possible by the labor of machine tools. Our problem is to encourage the right use of this leisure time to the end that a larger and larger percentage of the masses may approach the ideal of cultivated men and women. Culture is not a product of elementary education, nor even a necessary product of the colleges, although the foundation may, in part, be laid there; it results (though not always) from the spontaneous and sustained process of adult education. For the most part it begins when the formal pedagogy of the schools ends. It is encouraged and aided by such institutions as our museums and botanic gardens, with their exhibits and the lectures, docentry, and

more formal instruction based upon and correlated with those exhibits. Like the schools, these institutions minister to juvenile and adolescent education, but they differ from the schools in their emphasis on what has come to be called "adult education."

The educational program of the Brooklyn Botanic Garden provides for all three classes—juveniles, adolescents, and adults—its adopted standard being, *anything scientific or educational based upon plant life.*

The Challenge of Leisure.—There are 144 hours in the six working days of every week. It is scarcely a generation ago that the hours of labor for persons gainfully employed were 72 hours a week, or one half the total number. The eight-hour day meant 48 hours of work per week. On the basis of the NRA Codes, the hours of labor have been reduced to 35 a week, leaving 48 hours (not including Sundays) for sleep, and 61 hours a week, or more than ten hours a day, for meals and—for what? Conceivably one might loaf or play for ten hours a day, but, fortunately, few human beings are so constituted that such a program makes any appeal. Every normal person prefers to be profitably occupied. A certain amount of idleness may be profitable and physiologically beneficial, but the new hours for labor make the old problem of the best use of leisure more urgent than ever before.

This fact has now had national recognition, and Mr. Grover Whalen, as chairman of the President's Emergency Re-employment Committee for the City of New York, in 1933, appointed a special sub-committee to consider what the City might do as a community to promote the best use of the new hours of leisure. Schools of all grades, museums, botanic gardens, churches, and various other agencies of adult education already afford a large opportunity, but the work can still be expanded and improved. In particular, many, coming for the first time into hours of leisure beyond the needs of recuperative recreation, need to have their attention directed to these opportunities for profitable as well as pleasurable use of time, and their interest in them aroused and deepened.

When Aristotle, two thousand years ago, said that the main purpose of education was the right use of leisure, only the wealthy few had leisure; now, apparently, the great mass of the people

are coming into this inheritance. We all know that the word *school* is derived from a Greek word meaning *leisure;* the relationship may now be reversed so that leisure may come to mean school for many hitherto deprived of that opportunity. Said the former Secretary of War, Newton D. Baker, to the Banff Conference of the Institute of Pacific Relations, in 1933, "The only hope of mankind, where adult knowledge is a factor of public opinion, is a continuous process of education." To this work the Brooklyn Botanic Garden aims to make as large a contribution as its facilities and resources will permit.

The Social Need of Scientific Thinking.—"It is not to deny that one of the reasons of the incapability of the nations to deal successfully with the disastrous consequences of the world crisis is the insufficient development of social sciences in comparison with that of natural sciences, *and the feeble penetration of scientific thinking into the broad masses of population.*"

The quotation is from the "Greeting" from the Lithuanian University of Vytautas the Great to New York University on the occasion of its conference on The Obligation of Universities to the Social Order, in 1933.

It would, perhaps, not be an extreme statement to say that the present economic crisis is due in large part to the fact that men of big business and men in public office, as well as the much maligned "man in the street," have been thinking commercially, or myopically, or politically, or wishfully—almost any way except scientifically, and have been acting accordingly, or even quite thoughtlessly, except for the matter immediately in hand.

Herein is the strongest justification for science in a program of public education—its ability to teach, not only information about nature, but *a way of thought* which must become a habit of thought if civilization is to advance. This is the essence of science, and no scientific institution such as this botanic garden, no school or university, can render a more valuable or more needed service than to provide such a program of public education as will diffuse a knowledge of scientific method; this it is which should permeate all elementary and adult instruction until it becomes a habit of mind. The program of public education at the Brooklyn Botanic Garden is organized with the aim of making some contribution, however small, to this result.

Statistics.—Eighteen courses for adults and nine for children of high school age or younger were listed in the 1933–34 *Prospectus.* The total enrollment in all courses was 1,455 (Adults, 817; Children, 638).

The number of class exercises, lectures, addresses, and informal talks for the year reached a total of 1684, as follows:

1. Sessions of regular classes	639
2. Sessions of visiting classes from schools	677
3. Lectures to adults at the Garden	51
4. Lectures to elementary and high school pupils	446
5. Addresses at schools and clubs (extra mural)	75
6. Radio talks broadcast	27
	1915
Less duplication (lines 2 and 4)	231
Net total	1684

Docentry.—During the year, 42 garden clubs and other groups have had the services of a teaching guide (docent) by request, in addition to the regular, scheduled work of this nature.

Exhibits.—Twenty-one exhibits were installed during the year, not including those at the Garden in connection with the various Flower Days. The estimated total attendance has been more than 550,000, not counting the visitors to the Brooklyn Botanic Garden exhibit at the Chicago Century of Progress Exposition. Details of these exhibits are given on pages 92, 100, and 105.

Educational Tablets.—In the preceding report, we acknowledged the generous gift of $50, on December 17, 1932, to provide a bronze tablet giving brief geological information about "Boulder Hill" in the Garden. On February 8, 1933, this tablet was placed on a large glacial boulder at the foot of the Hill. The inscription reads as follows:

"Boulder Hill and the entire northern portion of the Botanic Garden are part of the terminal glacial moraine extending from The Narrows to Montauk Point. This tablet was given in 1932 by the Boys and Girls Club of the Brooklyn Botanic Garden."

Broadcasting.—More radio talks have been given this year than ever before. These have been given—27 in all—by Mr. Free, Dr. Graves, Miss Shaw, and Miss Jenkins. Their titles and the stations are given on page 148.

Newspaper Publicity.—The sending of periodic news releases to about 25 newspapers and 5 magazines concerning floral displays, educational work and related matters has continued as in past years by Dr. Graves as a regular activity of the Department of Public Education. These have been supplemented by releases concerning social and other Botanic Garden matters by the Brooklyn Publicity Bureau. In addition, an unusual number of news items have appeared without initiative on the part of the Garden. The total number of clippings received was 1,495, covering a wide geographic range. The number of editorial comments on various aspects of our work continues to increase.

School Service

As usual, our service to local schools during 1933 has comprised the instruction of school classes brought to the Garden by their teachers, the giving of talks and addresses at the schools, conferences with teachers concerning their work, and the supply of study material. Up to the close of the school year in June, 1933, study material had been supplied without charge. The amount requested steadily increased until, in 1932, more than 6,000 teacher-requests were met with material for the instruction of nearly 260,000 pupils. Most of this was living plant material, which had to be either collected or raised in the greenhouse, and culture medium (agar) for the study of germ life.

Our Agreement with the City of New York provides that, "the party of the second part [the Botanic Garden] shall, so far as any surplus resources will permit, furnish plants or botanic material for use in the teaching of botany in the public schools of The City of New York, and in case the supply of plants or materials for instruction is not exhausted by the demands of the public schools of the City, such plants and botanic materials may, at the discretion of the party of the second part, be furnished to other educational institutions within said City."

For a number of years past the amount of material supplied has been greatly in excess of incidental surplus. In the report for 1932 we noted that for the personnel alone required for this service 40 per cent. of the expense was provided from the private funds of the Garden. All of the expense for the material itself

FIG. 4. International Flower Show. Exhibit of Brooklyn Botanic Garden, 1933. Illustrating methods of plant propagation. Detail. Cf. Fig. 3. (Herbert Photos. 1738.)

has been provided from private funds from the beginning, as the City has never been asked to make any appropriation for the purchase of plants or plant material.

With greatly reduced private funds income, reduced Tax Budget appropriations, and greatly increased demands from the schools, we found ourselves in a position where the service could not be continued without funds for additional help. The only possible source for such funds appeared to be to make a nominal charge for the material supplied to High Schools. The plan was approved by the school authorities, who sent out a notice announcing it in September to the High Schools. These schools have a fund which may be applied to the purchase of study material.

A schedule of prices was prepared by our Department of Public Instruction, and a school service assistant (Miss Julia E. Best) was appointed, whose compensation was to depend entirely upon the amount received from the schools. Miss Best entered upon the duties of her position on September 7. The curator of public instruction reports (page 96) that the number of High School requests for plant material (421) were actually greater under the new plan, being 34 in excess of 1931 and 23 greater than in 1932. The number of Petri dishes called for slightly decreased, being 4,888 in 1933. This was only 594 less than in 1931 and 839 less than in 1932.

The service to Public Schools (grades below the High Schools) has been continued without charge.

Geographical Extension of Loan Service.—The number of requests for the loan of books, herbarium specimens, lantern slides, and preserved specimens continues to increase. Partly as a result of our broadcasting, we received numerous requests from other cities and states, including Connecticut, New Jersey, Florida (through Brooklyn Chamber of Commerce), Pennsylvania, District of Columbia, and South Dakota.

A quantitative expression of our school service is given in Table I, page 38. Attendance figures could have been greatly increased by substituting lectures to large groups for intensive class work with small groups. We believe, however, that such a change would have involved the sacrifice of valuable educational results.

TABLE I

Statistics of School Service

	1933	*1932*
Conferences with Teachers		
No. of conferences	127	83
No. of teachers involved	9,094	2,137
No. of pupils involved	209,000	95,695
Loan Lectures (Lantern Slides, etc.)		
No. of sets lent	38	22
No. of teachers involved	379	159
No. of pupils attending	19,034	6,320
Material Supplied		
Total number of requests from schools	609	643
Number of different institutions	196	220
High Schools and H. S. Annexes		
Brooklyn (Total No. 37)	28	29
Queens (Total No. 16)	9	9
Manhattan (Total No. 27)	13	14
Other Boroughs (Total No. 17)	9	5
Junior High Schools (Total in Brooklyn 22)	19	25
Colleges and Universities (Total in Brooklyn 7)	11	11
Elementary		
Brooklyn (Total No. 230)	60	82
Queens (Total No. 149)	3	6
Manhattan (Total No. 125)	3	4
Other Boroughs (Total No. 143)	2	3
Private and Parochial	19	32
Other Institutions	20	32
Number of potted plants for nature study	2,793	1,929
Number of Petri dishes filled with sterilized agar	4,858	5,730
Total number of teachers supplied with material	5,150	6,105
Total number of pupils reached	243,607	257,527
Living Plants Placed in School Rooms		
No. of schools	74	69
No. of plants	608	740
No. of teachers involved	756	891
No. of pupils reached	31,744	35,984
Plants Distributed (Raised in Classes)	21,764	27,520
No. of teachers taking plants	269	290
No. of children taking plants	933	983
Total number of schools represented	129	154
Seed Packets for Children		
No. of schools	381	549
No. of teachers	5,365	5,560
No. of pupils	214,395	223,397
No. of packets	643,178	670,202
Exhibits Provided.		
No. of exhibits	21	17
Viewed by	550,085	40,845

Plantations and Grounds

The purpose of our labeled plantations, and the educational program based upon them, is to bring "through the public eye into the public heart" [1] an interest in our native flora and its conservation, and an interest in the plant life of the world and the creations of horticulture as an added satisfaction and enrichment of human life. The first step toward accomplishing this is to make the Garden beautiful; the second step is to make it instructive in more than a casual or incidental way. We have innumerable evidences and assurances that this object is being accomplished more and more fully each year.

Local Flora Section

The Local Flora Section (Native Wild Flower Garden) was opened to members and their guests (for the first time since its rearrangement) on May 9, the occasion of the annual Spring Inspection. This Section was originally laid out (in 1911) on a Systematic basis, like the main Section of the Garden. Under the curatorial supervision of Dr. Svenson the Section has been rearranged on an Ecological basis, which was rather fully described in the preceding Annual Report (pages 96–99). The fence enclosing this Section and the two rustic gates, all the gift of our late lamented trustee, Mr. Alfred W. Jenkins, make it possible to control access to it, as is now done for the Japanese Garden and the Rose Garden. The intimate nature of the planting makes it necessary to restrict the entrance of the general public to times when guards or gardeners are in attendance. This garden, like the other two mentioned, is comparable to a special exhibit room of a museum. It contains many rare species of the local flora, as well as the commoner sorts, and its use, in even the slightest degree, for ordinary park purposes, even for aimlessly strolling through, would defeat its purpose. Classes are freely admitted when accompanied by a Botanic Garden guide, members with accompanying friends are admitted by appointment, at mutually convenient times, and the general public will be admitted whenever an adequate number of guards can be in attendance.

[1] Dr. John M. Clarke. Ann. Rept. N. Y. State Museum for 1913.

Laboratory Plaza

Nothing has contributed more to the attractiveness of the Garden as a whole than the completion of the Laboratory Plaza. The central motif is a circular compass 18 feet in diameter. The rays of the compass are paved with yellow, red, and black marble terrazzo. The yellow marble is from Siena, Italy; the red from Massa, Italy; and the black from Mazy, Belgium. At the center of the compass is a bronze armillary sphere, serving as a sun-dial, and designed by our landscape architect, Mr. Harold A. Caparn. The figures representing the signs of the zodiac were designed and modeled by his daughter, Miss Rhys Caparn. The sphere is mounted on a beautiful pedestal of Carver black granite, from Vinal Haven, Maine, encircled near the top with a bronze band bearing the following old classical sun-dial motto:

Serene I stand amyddst ye flowres
To tell ye passing of ye howres.

The pedestal rests on an octagonal platform of Stony Creek (Connecticut) pink granite.

No single object in the Garden has attracted more constant attention than this Armillary Sphere. There is a group of people around it almost continuously, and teachers frequently bring classes there for a lesson based upon the dial.

At either end of the north and south grass panels are garden urns of classic design, 3 feet, 6 inches high.

Planting of the Plaza.—The Magnolia area has been extended so as to include the Plaza, the planting being confined to Magnolia species and to shrubs belonging to the same family. The only exceptions are the edging of English Ivy and *Euonymus alatus* var. *compacta*, which are a part of the design only, but not a part of the labeled collection. The planting of this Plaza was provided for by the generous gift of $1,502 raised by subscription by our Woman's Auxiliary.

The new planting of Tulips along the west side of the Experimental Garden is recorded in the report of the Horticulturist (p. 89). This should make an interesting exhibit in 1934.

The transfer of the Paeonies to new beds near the north end of Cherry Walk is also recorded on page 89.

The first autumn frost, on the night of October 25–26, brought much of our fall bloom to an end earlier in the season than usual. Ice remained in the pool of the Conservatory Fountain until the afternoon of the 26th.

The Overlook, at the north end of the Rose Garden, was included in the five-year plan of permanent improvements published in the Botanic Garden RECORD for May, 1930. It was designed by Mr. Caparn, and was completed on May 7 by the firm of John Thatcher & Son, contractors. Like the conservatory fountain and the Armillary Sphere, it was made possible by the bequest of our late trustee, Mr. Alfred W. Jenkins. This has already become one of the most popular spots in the Garden.

Davidia in Bloom.—In 1919 a specimen of the Dove Tree, *Davidia vilmoriniana,* was planted among the Dogwoods, to which it is related. This tree was introduced into Europe in 1897 from China, where it was discovered in 1869 by a French missionary, Abbé Armad David, after whom it is named. As the hardiness of the plant in the Brooklyn climate is doubtful, it has been protected each winter. During the week of May 15, the tree came into bloom for the first time. As in the Flowering Dogwood, the so-called "petals" are bracts which enclose a cluster of small, inconspicuous flowers. When the flower-bud opens, the bracts are relatively small and greenish, later becoming larger and white. Unlike the Flowering Dogwood, which has the four petal-like bracts of the same size, one of the bracts of the *Davidia* is much longer and larger than the others. The tree, at present, is about 20 feet high. It bore only about 12 flowers.

The Dutch Elm-Disease, caused by a fungus *Graphium Ulmi,* while reported in New Jersey, has not, as yet, been detected in the Brooklyn Botanic Garden. The New York *Times* for August 11, 1933, reported that Dr. O. M. Liming, of the U. S. Department of Agriculture, found one diseased elm on Ocean Parkway near Prospect Avenue, Brooklyn. The disease first appeared in Ohio three years ago, and the second outbreak, reported in New Jersey, is said to have assumed large proportions, more than 200 infected trees having been located. The symptoms of the disease are a yellowing, browning, and wilting of the leaves, and the browning of the sapwood when young twigs are cut. The Federal

Public Works Administration (PWA) allocated $80,000 to the Department of Agriculture for control work.

Needs.—The initial planting of the grounds included an Ecological Section (near the Rock Garden), and an Economic Garden. For lack of curatorial oversight and gardening labor, these two sections have been abandoned for some time. It is important that they should be rehabilitated. The newly graded area north of the Japanese Garden affords a suitable area for a new location for the Economic Garden.

Several permanent supports are needed for vigorously growing vines. Mr. Caparn has prepared a design and specifications for a trellis and pergolas for the Silver Leaf (*Actinidia*).

North Addition.—The greatest need is the landscaping of the North Addition. (See page 20.)

International Seed Exchange

The systematic interchange of seeds between the United States and other nations (through both official and private channels) dates from the very beginning of this nation. After Thomas Jefferson returned to America from France, where he had represented the new United States of America, he began sending his French friends seeds of native American plants, receiving from them the seeds of French plants in return. This interchange continued for some twenty-three years.

"By his desire, our Consuls in every foreign port, collected and transmitted to him seeds of the finest vegetables and fruits that were grown in the countries where they resided. These he would distribute among the market-gardeners in the City [Washington] . . . not sending them but giving himself and accompanying his gifts with the information necessary for their proper culture and management, and afterwards occasionally calling to watch the progress of their growth. This excited the emulation of our horticulturists, and was the means of greatly improving our markets." [1]

In 1933 we exchanged seeds with 207 other gardens located in 50 countries, receiving a total of 2,525 packets of seeds of their native plants and sending in return 4,367 packets of seeds of native American wild flowers and other plants.

[1] Smith, Mrs. Samuel Harrison. The first forty years of Washington society. Scribners. New York, 1906. p. 394.

FIG. 5. Laboratory Plaza, facing west from the building. September 16, 1933. (8543.)

So far as our supply lasted, after other gardens had been supplied, packets were sent to members of the Garden—825 in all. About 95 packets were requested in excess of our ability to supply them.

The Library

"I have often thought that science would progress more if there were more reading." Thus wrote Charles Darwin to Sir Joseph Hooker, the director of Kew Gardens, in 1865. No doubt Darwin was right. There is probably a more systematic attempt to "keep up with the literature" now than in Darwin's time, but the great bulk of botanical publication today is the despair of botanists. To read all the current literature, even of one's limited field of special interest or research, would be physically impossible. The situation is reflected by the number of serial publications of which current numbers have been received in our library during 1933, namely 979. These publications are in 26 different languages. Most botanists of university training are more or less at home in four languages; many in five or more. But material in languages outside the Romance and Teutonic groups, such as Russian, Japanese, Finnish, Magyar, and several others, is unavailable to most readers except those to whom such languages are the native tongue.

In view of this bulk and diversity, it is increasingly essential to have the current literature easily accessible, together with journals devoted to abstracts and summaries. A library rich in current publications as well as in standard and classical works, is an indispensable tool of research, and equally important in centers of educational work.

For obvious reasons, it is important to have periodical publications promptly bound, especially when usage is considerable or more or less constant. Special attention is called to the statement in the appended report on the Library, that almost no binding has been done during 1933, and that there is now an accumulation of more than $3,000 worth of binding to be done. This becomes increasingly urgent since the number of users of the library steadily increases.

Technical publications are expensive, for the market is comparatively limited and the cost of publication relatively high since it in-

volves a great deal of " foreign language " composition and tabular matter for the printer, numerous illustrations, and a good grade of relatively permanent paper. The list of desiderata now on hand, noted in the Library report, amounts to more than $6,000 worth of publications. A large proportion of these have been asked for by readers; others are classical and standard works that should be in every first-class botanical library.

In a previous report we have noted the fact that this Library did not have a generous initial fund for the purchase of a nucleus. It started in January, 1911, with a gift of nine books, and has been gradually built up to its present size of 30,938 volumes and pamphlets by annual expenditures of small sums, supplemented by items secured by gift, publication, and exchange. The Library has a small endowment nucleus. Its use and usefulness increase each year. Its further endowment affords an admirable opportunity for the advancement of science and education by private philanthropy.

The Herbarium

The statement in the first paragraph of the appended report of the associate curator of plants emphasizes the importance of the herbarium and its relation to published records of plants in books and periodicals. During 1933 the herbarium of flowering plants (Phanerogams) increased by 4,000 specimens, lacking eleven, and that of the non-flowering plants (Cryptogams) by 1,125 specimens. 473 specimens were loaned for study to other institutions.

Even at its present moderate rate of growth it will not be long before the Herbarium will have quite outgrown its present quarters.

Membership

The support of museums, botanic gardens, and zoological parks is a civic duty. These institutions minister to the entire population, whereas the schools minister directly only to those under twenty-five years of age. During 1933 113 new members were enrolled, as against 222 in 1932. The net decrease has been 57. The figures are 1,205 in 1933 as against 1,262 in 1932. The figures, though small, are very satisfactory when we recall the eco-

nomic condition of the world, and realize that more institutions and organizations are reporting large net losses than net gains. Our record is the result of the continued effective efforts of the Woman's Auxiliary. Mrs. Henry J. Davenport has continued as Chairman of the Membership Committee of the Auxiliary, and the activities chiefly responsible for new members have been in charge of Mrs. Whitney Merrill, member of the Auxiliary and Field Secretary.

The distribution of surplus propagating material to members continued for the ninth year. This is one of the numerous privileges extended to members in consideration of the payment of their membership fee. It has the effect of increasing interest, not only in the Botanic Garden, but also in plant life and gardening, and thus should be of advantage to commercial horticulture. In fact, we have evidence that such is the case. During the year several hundred members were supplied with propagating material in the total of 4,170 plants.

Woman's Auxiliary

The Woman's Auxiliary has become an integral and indispensable part of the regular work of the Garden. At the close of the year it had 113 members. Under its auspices numerous garden clubs and other organizations held meetings at the Garden, and the course in Flower Arrangement was initiated. This was one of the most popular and better attended of our winter courses. Six sessions were held from January 3 to February 7, and 117 persons were registered for the course. The first three lectures were given by Miss Mary Averill, honorary curator of Japanese gardening and floral art at the Garden. Miss Averill's book on Japanese Flower Arrangement, published in 1913, was the first book on flower arrangement of any kind to be published in America. The other lectures were given by Miss Maude Mason (one); and by Mrs. William H. Cary, author of the second American book to be published on flower arrangement — *Arranging Flowers Throughout the Year* (two lectures). It is of interest to note that the authors of these pioneer books are both officially connected with the Brooklyn Botanic Garden.

The Woman's Auxiliary luncheon was held in the rotunda of

the Laboratory Building on February 7, following the last session of the Flower Arrangement course. There were 107 in attendance. The address was given by Dr. Svenson, associate curator of plants, on the Local Flora Section of the Garden and his scientific and educational work in connection therewith.

On November 22, under the auspices of the Auxiliary, Dr. Norman T. McClintock, of Rutgers University, gave a lecture at the Garden on the subject *Romance in the Commonplace*. The lecture was illustrated by motion pictures of plants, insects, humming birds, and other subjects and proved to be a fascinating revelation about more or less commonplace events in the plant and animal worlds.

Among other subjects shown were the growth of lettuce, the development of a pea pod from a flower, the twining of tendrils, and the growth movements (including nutation) of various wild flowers. The auditorium, which seats 570, was filled to capacity. The net proceeds of $735 were contributed by the Auxiliary to supplement the amount available for per diem labor at the Garden, thus reducing lay-offs and the unemployment that would result.

Nineteenth Annual Spring Inspection

The Nineteenth Annual Spring Inspection was held, as usual, on the second Tuesday of May, which fell on the ninth. This has become one of the largest and most popular garden parties in the metropolitan district. The attendance in 1933 was one of the largest on record, being estimated at well in excess of 1,000.

The tour of the grounds included inspection of the following new features: Laboratory Plaza, planted in April, 1932; Boulder Hill Bronze Tablet, the funds for which ($50) were presented by our Boys and Girls Club in 1932; the Japanese Garden, in which there were several improvements and new features, made possible by a gift of private funds and executed by Japanese workmen, under the supervision of Miss Mary Averill; Cherry Walk, which was at the height of bloom; the Overlook, at the north end of the Rose Garden, affording an excellent view of the entire garden from a height of 20 feet; the Local Flora Section, opened on Inspection day for the first time since it was replanted along ecological lines by Dr. Svenson; and the North Flatbush Avenue Approach, re-

cently done over, with boulder banks on each side of the walk, newly paved with green "amesite" and broken by three new flights of steps; also the rows of hornbeams planted on either side of the walk leading to the gate. These trees will be trained so as ultimately to form a pleached alley. So far as we know, there is no example of a pleached alley in a public park in or near New York.

The indoor exhibits included: Twenty-five photographs of flower arrangements done by Mrs. Cyrus Winslow Merrell from arrangements made by Mrs. William H. Cary. These included the originals of the sixty illustrations in Mrs. Cary's new book, *Arranging flowers throughout the year;* Illustrations of artificial flowers in various media extending over the past two centuries. This collection was made by Mrs. Richardson Wright, and was exhibited through her courtesy. Also Photographs of illustrations in the *Codex Juliae Aniciae*, of Dioscorides, 512 A.D., lent for this exhibit by Miss Pauline Goldmark, of the Hartsdale (N. Y.) Garden Club; 300 mounted herbarium specimens of cultivated plants prepared by Dr. Henry K. Svenson, including tulips, narcissus, crocus, and other plants, mounted so as to preserve their natural colors as well as structural features; Design, in perspective, of the North Addition of the Botanic Garden, by Mr. Harold A. Caparn. This is reproduced as figure 1 of this Report. Tea was served, as usual, by the Woman's Auxiliary.

Personnel

On December 7 occurred the death of Mr. Frank L. Babbott, a Life member and Patron. He was president of the Board of Trustees from May, 1920, to May, 1928, and in that capacity was ex officio a member of the Botanic Garden Governing Committee. From 1928 until his death he was honorary president of the Board. Mr. Babbott was a frequent contributor of funds to the Botanic Garden.

Mr. Richard R. Bowker, a Life Member of the Institute, and a member of the Board of Trustees, died on November 12, 1933. In 1928 Mr. Bowker presented to the Garden the beautiful bronze Merchild, done by Miss Isabel M. Kimball. Since April, 1929, this has been an object of much interest in its naturalistic setting in the bed of the Brook, just south of the "swamp" in the Ecological Section.

Mr. Edwin Gould, a Patron and member of the Botanic Garden Governing Committee, 1926–1929, died suddenly on July 12, 1933, at his estate on Cove Road, near Oyster Bay, Long Island, at the age of 67 years. In 1926 Mr. Gould contributed $25,000 to the Citizens Endowment Fund then being raised.

Mr. Calvin W. Foss, librarian, was absent throughout the year on sick leave. During his absence Mrs. Emilie Perpall Chichester has been Library Assistant in Charge.

On September 1, 1933, Miss Ellen Eddy Shaw, curator of Elementary Instruction, completed twenty years of service at the Garden, as follows: Instructor, September 1, 1913–December 31, 1914; Assistant Curator, Public Instruction, January 1–December 31, 1915; Curator of Elementary Instruction, January 1, 1916–.

At a meeting of the Botanic Garden Governing Committee, on June 22, the members present expressed warm appreciation of Miss Shaw's services to the Garden and, through the Garden, to the Borough of Brooklyn during these twenty years. A resolution was unanimously passed requesting the director so to notify Miss Shaw, and to convey to her an expression of the high regard and affection of the Committee.

On May 22, the Garden Teachers Association of the Botanic Garden gave a dinner in honor of Miss Shaw, on November 12 a tea for the Botanic Garden personnel and officials was given at the home of the Director, and on December 15 a reception and tea was given in Miss Shaw's honor at the home of the chairman of the Governing Committee, Miss Loines.

Beginning September 7, Miss Julia E. Best, A.B., Barnard College 1931, M.A., Columbia University 1933, accepted appointment as School Service Assistant in the Department of Public Instruction, to assist in the supply of study material to high schools and colleges. (Cf. p. 37.)

Miss Mary Dorward, a graduate of the Pratt Institute School of Library Science, 1933, very generously contributed her services without compensation as library assistant from October 2 until the end of the year.

Mr. Gerald Sherow gave his services gratis in the Propagating Department for a total of twenty-two days between the following dates: December 18, 1933–January 25, 1934.

From June 5 to the end of the year, Mr. Henry Funk, gardener, contributed his services without pay for the sake of the experience of being at the Botanic Garden.

Financial

Only a slight acquaintance with the facts enables one to appreciate on what a very modest scale the Brooklyn Botanic Garden has been launched and carried for twenty-three years. The Director of one of our public museums recently reported to a scientific congress that, during the past quarter century (the lifetime, lacking two years, of the Brooklyn Botanic Garden), $38,000,000 had been raised and expended in developing the various branches of the museum. The same institution, now more than fifty years old, has only recently made public a statement emphasizing the fact that it is very inadequately financed. No doubt it is, considering the extent, importance, and results of its work, and the public response to the opportunities it offers. But such figures dwarf the modest total of a little over $3,100,000 expended for the establishment of the Brooklyn Botanic Garden, including the initial cost of buildings, and all other permanent improvements and the annual maintenance budgets for the past twenty-three years.

This comparison is made because, to those even slightly familiar with the rapid growth and wide expansion of the activities of the Botanic Garden, the contrast serves to emphasize the conservatism and extreme economy that have characterized the financing of this institution.

The work is not now financed on a scale commensurate with its importance and its human appeal. The Brooklyn Botanic Garden could double its services to science and education if its annual private funds income were increased only fifty per cent. The present annual budget of approximately $200,000 is derived nearly equally from the Tax Budget Appropriation of the City of New York, and from private funds income. One million dollars of additional endowment, yielding approximately $55,000 additional income, would meet the existing needs, providing, of course, that the Tax Budget appropriation does not fall below its 1932 figure.

Passing over the importance of our work in intangible ways that cannot be registered by recording turnstiles, it must be recog-

nized that attendance figures which reach more than 38,300 for one week-end, nearly a quarter of a million for one month, and more than one million and a quarter for a calendar year are alone evidence of sufficient public interest and benefit to justify more nearly adequate financing.

Public Interest in Science and Art

The Office of Education, U. S. Department of the Interior, has published a report on the "Recent progress and condition of museums." [1] When we consider the extent to which modern civilization is dependent upon scientific research and inventions based upon its results, it is interesting to note that the combined public and private support of public education through the medium of science museums, in the United States in 1930, was less than two-thirds that of art education through art museums.

According to Table 10 of the above mentioned report, the aggregates of total incomes of public museums in 1930 was, for art museums, $7,394,000; for science museums, $4,796,000. The income from endowment of art museums in 1930 was $4,118,000; of science museums, $3,258,000, or about three-fourths that of art museums. Income from gifts and dues was, for art, $511,000; for science, $390,000, or less than four-fifths that for art. And yet this is often called "the age of science." In fact, the large fortunes out of which art has been so generously endowed were made possible, in large part, by scientific research and invention. Few fortunes have been made by art. Art is endowed by science. Science is endowed by art, but not financially.

Do these figures mean that, notwithstanding our debt to modern science, more people are interested in art than in science? Or that more people can understand art than can understand science? Or, possibly, that those whose interests are in art are possessed of more of this world's goods, or are perhaps more generous or more public spirited? It may well be that a part of the answer is contained in each of these four suggestions. In any event, the fact remains that art museums are more generously supported in the United States than are science museums.

[1] Bulletin, 1931, No. 20. By Laurence Vail Coleman, Director, the American Association of Museums. Washington, 1932.

Botanic gardens (and zoological parks) are not included in this report, but museums operated in or by such parks or gardens are included. We would not for a moment wish to minimize the importance of generous support of art; it more than merits all it is ever likely to get. But the above contrast is full of meaning and ought to be full of suggestion for all who are interested in the advancement and diffusion of science, and the development of the Brooklyn Botanic Garden.

Tax Budget and Private Funds

The Tax Budget appropriation for maintenance in 1933 was as follows:

	Requested	*Granted*	*Change from 1932*
Personal Service	$ 84,660.00	$69,266.00	$13,394.00 (Decrease)
Other Codes	16,465.00	13,713.44	2,751.56 (Decrease)
	$101,125.00	$82,979.44	$16,145.56 (Decrease)

The Private Funds Budget was $92,943.52, as against $99,-580.35 in 1932, a decrease of only $6,636.83, as against the Tax Budget decrease of $16,145.56.

The Private Funds Budget was $9,964.09 more than the Tax Budget.

For the past six years the percentages of the two budgets have been as follows:

	1928	*1929*	*1930*	*1931*	*1932*	*1933*
Tax Budget	48%	43%	44%	48%	50%	47.2%
Private Funds	52%	57%	56%	52%	50%	52.8%

Collections Funds Contributions

Although the *Agreement* between the City of New York and the Botanic Garden provides that the City shall include in its annual Tax Budget appropriations for the support of the Garden a sum or sums for the purchase of books and publications, the City has never been asked to make any appropriation for that purpose. The City is not obligated to make appropriations for the purchase of plants, but is obligated to appropriate for the care of all collections. We are, therefore, dependent upon private funds

for the purchase of plants (including herbarium specimens) and all publications. The Collections Fund is normally for this purpose. Fortunately, some of the endowment fund income is also available for the same purpose. We say "fortunately," for the contributions to the Collections Fund vary. The amount for 1927, for example, was 38 per cent. greater than for 1933. There has been a steady decrease during the past seven years, as follows:

1927	*1928*	*1929*	*1930*	*1931*	*1932*	*1933*
$9,882	$7,420	$7,282	$6,539	$6,762	$6,157	$6,134

The amount available annually has always been less than was needed. It is hoped that eventually there will be endowment income sufficient to place this aspect of our work on a permanent assured basis, and make it unnecessary to depend so largely upon contributions solicited each year. During 1933 a large part of the Collections Fund (with the consent of the contributors) was used for labor to help decrease unemployment.

Legacies

E. Addie Austin Bequest.—For a number of years a frequent attendant at the Garden and its functions was Miss E. Addie Austin. Miss Austin's death occurred on January 21, 1933. Her will contained the following provision:

"I give and bequeath to the Brooklyn Botanic Garden and Arboretum the sum of One Thousand Dollars ($1,000) to be used for its corporate purpose."

This legacy was received on August 3, 1933, and has been credited to the endowment increment principal account.

Alfred W. Jenkins Bequest.—The death of Mr. Alfred W. Jenkins, a Life Member and Patron of the Garden, a Trustee, and a member of the Botanic Garden Governing Committee, in Vichy, France, on September 28, 1932, was recorded in our preceding Annual Report. In his will, Mr. Jenkins bequeathed $5,000 to the Botanic Garden. On account of numerous urgent needs and in consideration of the fact that Mr. Jenkins's chief interest was in beautifying the grounds, it was decided to expend this amount for that purpose. Among the objects financed with this bequest are the following:

1. The Armillary Sphere in the center of the paved compass in the Laboratory Plaza.
2. The pedestal of Carver black granite supporting the Sphere, and the bronze band around the pedestal.
3. The bronze tablet to mark the sphere.
4. The terrazzo paving of the compass.
5. Four vases in the Laboratory Plaza.
6. Construction of the Overlook, with seats, at the north end of the Rose Garden.
7. Bronze tablet to mark the Overlook gift.

Appended Reports

The Reports on Research for 1933, the administrative departmental reports, and Appendices 1–8, which follow this report, contain more detailed information concerning the year's activities and accomplishments.

Respectfully submitted,

C. Stuart Gager,
Director.

REPORTS ON RESEARCH FOR 1933

Plant Pathology

By George M. Reed

Studies on the Inheritance of Resistance of Oat Hybrids to Loose and Covered Smut

Experiments with the Second Generation of Oat Hybrids. The second generation plants of four oat hybrids, Canadian × Monarch, Canadian × Monarch Selection, Gothland × Black Mesdag, and Danish Island × Monarch, were available for the study of the inheritance of resistance to loose and covered smut. Two series of plants of each hybrid were inoculated, one with the loose smut and the other with the covered, and the percentage of susceptible plants determined.

Hybrid 79, Canadian × Monarch, was represented by three crosses, and is a hybrid between the variety Canadian, susceptible

to both loose and covered smut, and Monarch, resistant to the loose smut, but susceptible to the covered. There were 287 second generation plants inoculated with the loose smut, and 113 (39.3 per cent.) were infected. These results clearly indicate that segregation for resistance to the loose smut occurs in the second generation. In the corresponding series with the covered smut, 90 plants were inoculated, and 89 (98.8 per cent.) were infected; thus the second generation plants were as susceptible to covered smut as the two parental varieties.

Hybrid 80, Canadian × Monarch Selection, affords an interesting contrast to Hybrid 79. Both parental varieties are susceptible to the loose smut, while Monarch Selection is resistant to the covered smut. There were 97 second generation plants inoculated with the covered smut and 28 (28.8 per cent.) were infected. Segregation for resistance to the covered smut is indicated. There were 49 second generation plants inoculated with the loose smut, and 48 (97.9 per cent.) were infected; thus the second generation plants were as susceptible to the loose smut as the two parental varieties.

Hybrid 81, Gothland × Black Mesdag, is a cross between two varieties which are resistant to covered smut, while Gothland is susceptible to the loose smut. There were 97 plants inoculated with the loose smut and 26 (26.8 per cent.) were infected, a result usually obtained in the second generation when a susceptible variety is crossed with a resistant. In the series with the covered smut, there were 47 plants inoculated, and none were infected, thus corresponding in their behavior to the two parental varieties.

Hybrid 82, Danish Island × Monarch, was represented by five crosses. Danish Island is very susceptible to the loose smut and resistant to the covered smut, although occasionally a few plants are infected. Monarch, on the other hand, is very resistant to the loose smut and susceptible to the covered. There were 293 second generation plants inoculated with the loose smut and 57 (19.4 per cent.) were infected. In the series with the covered smut there were 287 plants inoculated, and 205 (71.4 per cent.) infected.

The results with Hybrids 79, 81, and 82, with the loose smut, suggest a characteristic segregation on the basis of a ratio of three resistant plants to one susceptible. The percentage of infection

in Hybrid 79 was much higher than might be expected. However, a large number of plants, namely 287, were inoculated, and it is interesting to note that the three different crosses of this hybrid gave very similar results.

The results with Hybrid 80, inoculated with the covered smut, also indicate a segregation on the basis of a ratio of three resistant to one susceptible plant. Hybrid 82, represented by five different crosses, has given a very different result with the covered smut. The segregation in the second generation has indicated three susceptible plants to one resistant, just the opposite from the results previously described. There were a large number of plants of the five crosses inoculated, and the range of infection in the different crosses was quite similar. It may be noted that the one parent, Monarch, is completely susceptible to the covered smut, and that the other parent, Danish Island, sometimes contains infected plants.

In Hybrid 79, both parents were very susceptible to the covered smut, and practically all of the second generation plants were infected. Thus, these plants were as susceptible to this smut as the parental varieties. Similar results were observed in Hybrid 80 with reference to the loose smut. In this case also, both parental varieties were extremely susceptible to the loose smut. In Hybrid 81, the two parents were resistant to the covered smut, and complete resistance was observed among the second generation plants.

Experiments with the Third Generation of Oat Hybrids. The third generation progenies of two different oat hybrids were grown. Of Hybrid 61, Orientalis × Victor, there were 47 third generation progenies inoculated, one set of seed with the loose smut, and another with the covered. Both parental varieties are very susceptible to the loose smut, and the progenies grown gave percentages of infection varying from 68.1 to 100, in 13 of them all the plants being smutted. The variety Victor is very susceptible to covered smut, while Orientalis is resistant. Of the 47 progenies, 8 were entirely resistant, 24 gave infections of 8.3 to 47.8 per cent., and the remaining 15, more than 51 per cent. infection; in 4 of the progenies all the plants were smutted.

There were grown 33 third generation progenies of Hybrid

64, Rossman × Monarch. Rossman is susceptible to loose smut and resistant to the covered, while Monarch is exactly the reverse in its behavior. The progenies showed independent behavior with reference to these two smuts. In the series inoculated with the loose smut, 5 were resistant, 23 gave less than 50 per cent. infection, and 5 gave more than 70 per cent. In the series with the covered smut, 13 progenies were resistant, 12 gave less than 50 per cent. infection, and 8 more than 50 per cent.

Experiments with the Fourth Generation of Hybrids. In former reports, the data on many additonal oat hybrids have been recorded and, during the past year, fourth generation progenies of some of these were grown.

Hybrid 18, Silvermine × Black Mesdag, was represented by 69 progenies, and Hybrids 34 to 36, Early Champion × Black Mesdag, by 42 progenies. Practically all of these in all the hybrids had descended from resistant third generation families. Silvermine and Early Champion are both very susceptible to loose and covered smut, while Black Mesdag is resistant to both and, throughout the second, third, and fourth generations, the hybrids have shown a very similar behavior to loose and covered smut. During the past few years very extensive data have been accumulated on these two sets of hybrids, and have been prepared for early publication.

There were 85 fourth generation progenies of Hybrids 29 to 32, Fulghum × Black Mesdag, tested with the Fulghum Race of loose smut. Most of these had descended from resistant third generation progenies, and complete resistance to the special race of loose smut was established in the fourth generation.

A large number of fourth generation progenies of Hybrids 50 to 69, involving various combinations of crosses, were grown. The accumulated data are valuable in determining the mode of inheritance of smut resistance in these various types of hybrids. Separate sets of progenies, one inoculated with loose smut and the other with the covered, were planted.

Physiologic Races of Oat Smuts

Further experiments were carried out with some of the physiologic races of both loose and covered smut. The most extensive

data were obtained with collections of these smuts on the Fulghum type of oats. Through the cooperation of Mr. T. R. Stanton, Office of Cereal Crops and Diseases, Bureau of Plant Industry, Washington, D. C., we now have 10 collections of loose smut from different parts of the South, where Fulghum oats are extensively grown. These collections have been tested out on a number of different varieties, and their behavior determined. We have been able to demonstrate clearly that there are at least two distinct races of loose smut specialized to the Fulghum oats. These are distinguished on the basis of their ability to infect particular oat varieties.

Three collections of covered smut on Fulghum oats have been obtained from the South. One of the most interesting features of these collections is their ability to infect Black Mesdag, a variety resistant to all other known collections of both loose and covered smut.

Bunt of Wheat

Additional experiments were carried out with several physiologic races of bunt of wheat. These were tested on wheat varieties which have shown differences in their reaction to specialized races of the two species of bunt. The particular purpose of the experiments was to determine whether certain wheat varieties were identical in their behavior to the various races, or whether these varieties could be separated from each other on the basis of their infection by distinct races of bunt.

Sorghum Smuts

Miss D. Elizabeth Marcy has continued her studies on the inheritance of resistance of various sorghum hybrids to the covered kernel smut of sorghum. The second generation plants of 18 sorghum crosses were grown, each cross being represented by 50 to 100 plants. On the basis of the behavior of the parental varieties, the crosses may be divided into three groups:

1. Both parents resistant. There were two reciprocal crosses between Feterita and Dwarf Yellow Milo, varieties which have consistently been resistant to the covered kernel smut. All of the inoculated second generation plants remained entirely free from infection.

2. One parent susceptible, and the other parent resistant to the covered smut. There were 14 crosses between a susceptible and resistant variety. In 7 crosses, the resistant Feterita was combined with the susceptible Sumac Sorgo, Red Amber Sorgo, and Dawn Kafir. In all these cases, second generation plants gave 47.7 to 72.1 per cent. infection. In contrast to these hybrids are those in which the resistant Milos are crossed with susceptible varieties. There were also 7 crosses of this type, Black Amber Sorgo, Blackhull Kafir, and Dawn Kafir, being combined with Dwarf Yellow Milo, Standard Yellow Milo, and Standard White Milo. In these hybrids, the second generation plants gave 8.1 to 17.1 per cent infection. It is evident from the results that the resistance of Feterita to covered smut is different from that of the Milo varieties.

3. Both parents susceptible to the covered smut. There were two hybrids between susceptible varieties, Blackhull Kafir and Dawn Kafir, being crossed with Red Amber Sorgo. The second generation plants contained 61.9 to 67.5 per cent. of smutted plants.

A series of third generation progenies belonging to four different hybrids was inoculated with the covered smut. In every case, these progenies were descended from the surviving second generation plants which had been inoculated with this smut in the previous year. There were 10 third generation progenies of Dawn Kafir × Red Amber Sorgo, both very susceptible varieties. The second generation plants in the previous year gave 50.9 per cent. infection. All of the 10 third generation progenies contained infected plants, the percentage varying from 20 to 95.

There were 30 third generation progenies of the hybrid of Black Amber Sorgo × Dwarf Yellow Milo, the former being very susceptible, while the latter is resistant. Three of these progenies proved to be completely resistant, 23 gave from 5.2 to 26.6 per cent. infection, and 4 gave 42.1 to 60.0 per cent.

There were 30 third generation progenies of the hybrid Feterita × Dwarf Yellow Milo. Both of these varieties are very resistant and, as noted above, the second generation of this cross gave entirely negative results. It was found, however, that 5 of the third generation progenies contained infected individuals, the percentage

varying from 5.5 to 31.2. The remaining 25 progenies contained no smutted plants.

There were 30 third generation progenies of the hybrid Dwarf Yellow Milo × Feterita. This hybrid is the reciprocal of the one just referred to. Only one of these progenies contained an infected plant, and in this progeny one plant out of 14 was smutted.

There were 170 fourth generation progenies of two hybrids of Feterita × Sumac Sorgo grown. These were descended from the surviving plants of third generation progenies which gave different percentages of smut, and the results obtained have thrown a great deal of light on the inheritance of smut resistance in these particular hybrids.

One of the important problems in connection with these studies is that of securing the infection of all susceptible individual plants. Further experiments were made on the influence of environal factors on the infection of some susceptible and resistant varieties. It was found that a much higher percentage of smutted plants of such susceptible varieties as Blackhull Kafir, Dawn Kafir, Dakota Amber Sorgo, Sumac Sorgo, and Red Amber Sorgo, was secured when the inoculated seed were germinated in sand with a low percentage of water. Excellent results were also obtained when a somewhat higher percentage of moisture was used, to which a weak sugar solution was added. In all cases, resistant varieties such as Feterita and Milo remained free from smut. In general, all the susceptible varieties and the hybrids gave higher percentages in 1933 than in 1932, probably due to securing an environment more favorable to infection during the seedling stage.

A large amount of data on the inheritance of various morphological features in relation to smut resistance has been obtained. The most extensive studies have been made on the inheritance of pithy and juicy stem, and on the red and green color of seedlings.

Cultural Characteristics of the Oat Smuts

Mr. L. Gordon Utter has continued his studies on the characteristics of both loose and covered smut of oats as grown in cultures in flasks. Under natural conditions, the smuts are parasites which invade the host plant in the young seedling stage and

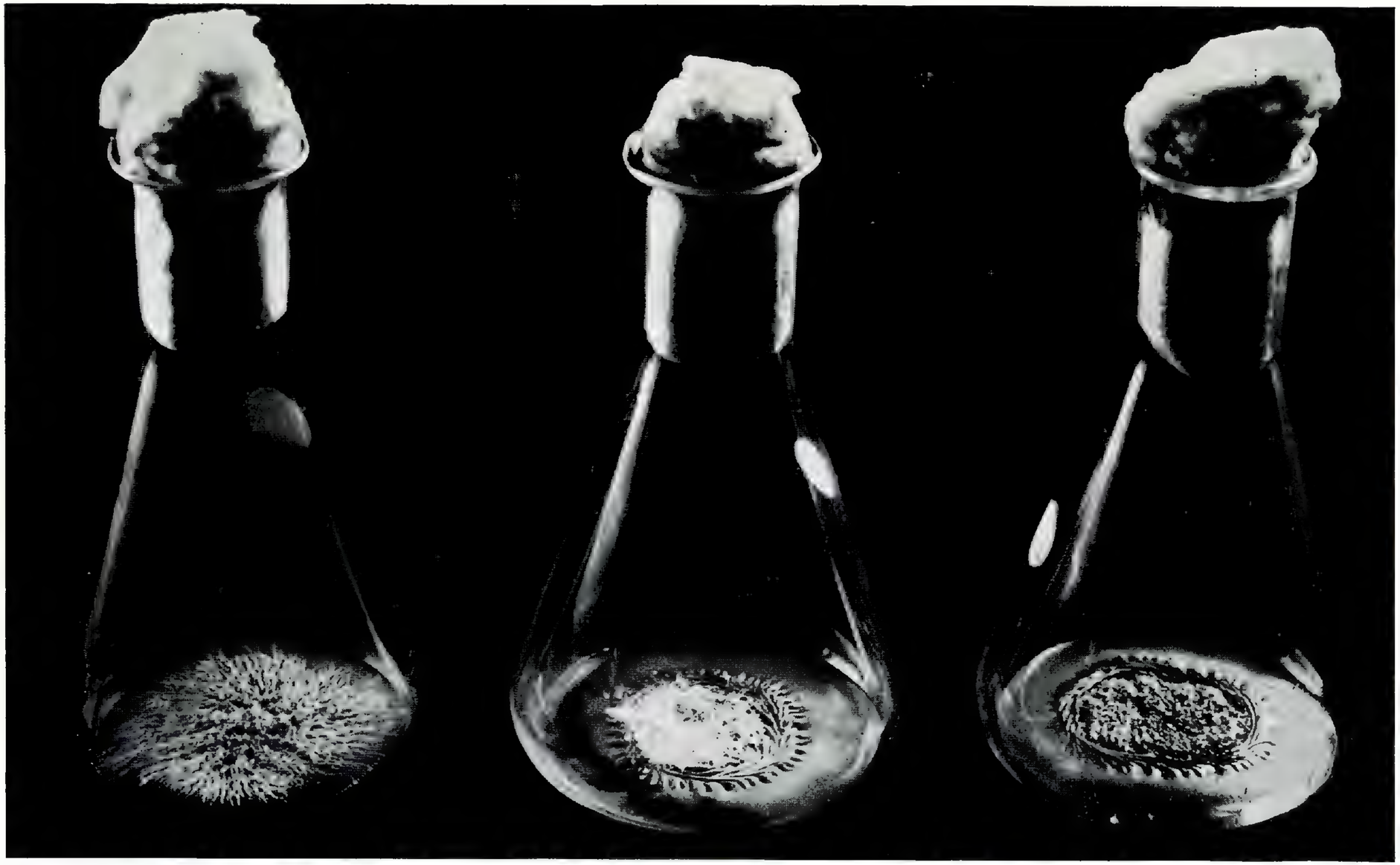

FIG. 6. Cultures of loose smut of oats in flasks. Each culture was developed from a single chlamydospore, and illustrates some of the characteristic differences which may be observed within the same physiologic race of loose smut. (8001.)

continue their development until the heading time of the oats, when the flowering parts are replaced by enormous numbers of black dust-like spores. These spores are known as chlamydospores and, under favorable conditions, germinate, producing a short hypha, or thread, on which are developed secondary spores, or conidia. It is by means of these conidia that the invasion of the young seedling oat plant takes place. Both chlamydospores and conidia, however, may be transferred to suitable substances in flasks, where they will give rise to characteristic growths, which may be studied and compared one with the other. The appearance of three cultures of the loose smut of oats is shown in figure 6.

These cultures in flasks are interesting for a comparison of the behavior of the two species of smut, and also for the highly specialized physiologic races. The cultures may be developed by the isolation of single chlamydospores, or by the isolation of the secondary conidia, and cultures derived by different methods have been used in the studies. Many isolations from single chlamydospores of both loose and covered smut have been obtained. Some of the cultures of loose smut are very similar in their appearance, while others show considerable variation. The same is true of the cultures of covered smut. Further, many of the cultures of the covered smut are essentially identical with those of the loose smut, and it does not seem possible to clearly differentiate the two species by constant characteristics of the cultures.

Comparisons have been made between the cultures of different races, derived from single chlamydospores. Many of the cultures of the same race are essentially identical in appearance, while others show marked differences. Further, cultures from different races can be selected which are remarkable for their uniformity and, by a proper selection of cultures, very diverse types of growth may be obtained.

Many isolations from single conidia have also been made, and similar differences in the behavior of the cultures to those isolated from chlamydospores have been observed.

Some inoculation experiments have been carried out. Cultures of loose smut derived from single chlamydospores have been used to inoculate Gothland and Monarch oats, the former being very

susceptible to the particular race of loose smut used, while Monarch is resistant. In most of the experiments, Gothland was successfully infected, while Monarch remained free. Similar experiments were carried out, using cultures of covered smut and, in these experiments, Monarch was infected while Gothland was not. Attempts have been made to infect both Gothland and Monarch with single conidial cultures of definite races of the two smuts. Other experiments have been made in which a culture derived from two conidia in certain combinations has been used.

Graduate Students and Independent Investigators Enrolled During 1933

In addition to the members of the Botanic Garden personnel, four graduate students and independent investigators were engaged in carrying on botanical research in the laboratories of the Garden.

Mrs. Marie E. Conklin has continued her investigations on the bacteria which form the tubercles on the wild legumes. Her studies involve the problem of the cultural characteristics of the bacteria isolated from different plants, and also their capacity for infecting. She began her studies at the University of Wisconsin, where she obtained the A.M. Degree in 1930. She is continuing her investigations, with a view to submitting the data as a basis for a Doctor's thesis at Columbia University.

Dr. Frances A. Hallock, Associate Professor of Biology in Hunter College, has used some of our facilities in connection with her study of the morphology and relationship of the evergreen shrub *Gaarya*.

Dr. Elva Lawton, a member of the Biology Department of Hunter College, has continued her investigations on regeneration and polyploidy in ferns. Her studies are a continuation of researches carried out in the University of Michigan, where she received the Doctor's Degree in 1931.

Mr. Hans E. Vollert, during the first part of the year, was enrolled at New York University, majoring in plant pathology at the Botanic Garden. Mr. Vollert is a graduate of the University of Leipzig, and also has the equivalent of the degree of Master of Science from that Institution. He was engaged in the study of the cultural characteristics of certain smuts, and had also taken up some work on the thrips of the iris and gladiolus.

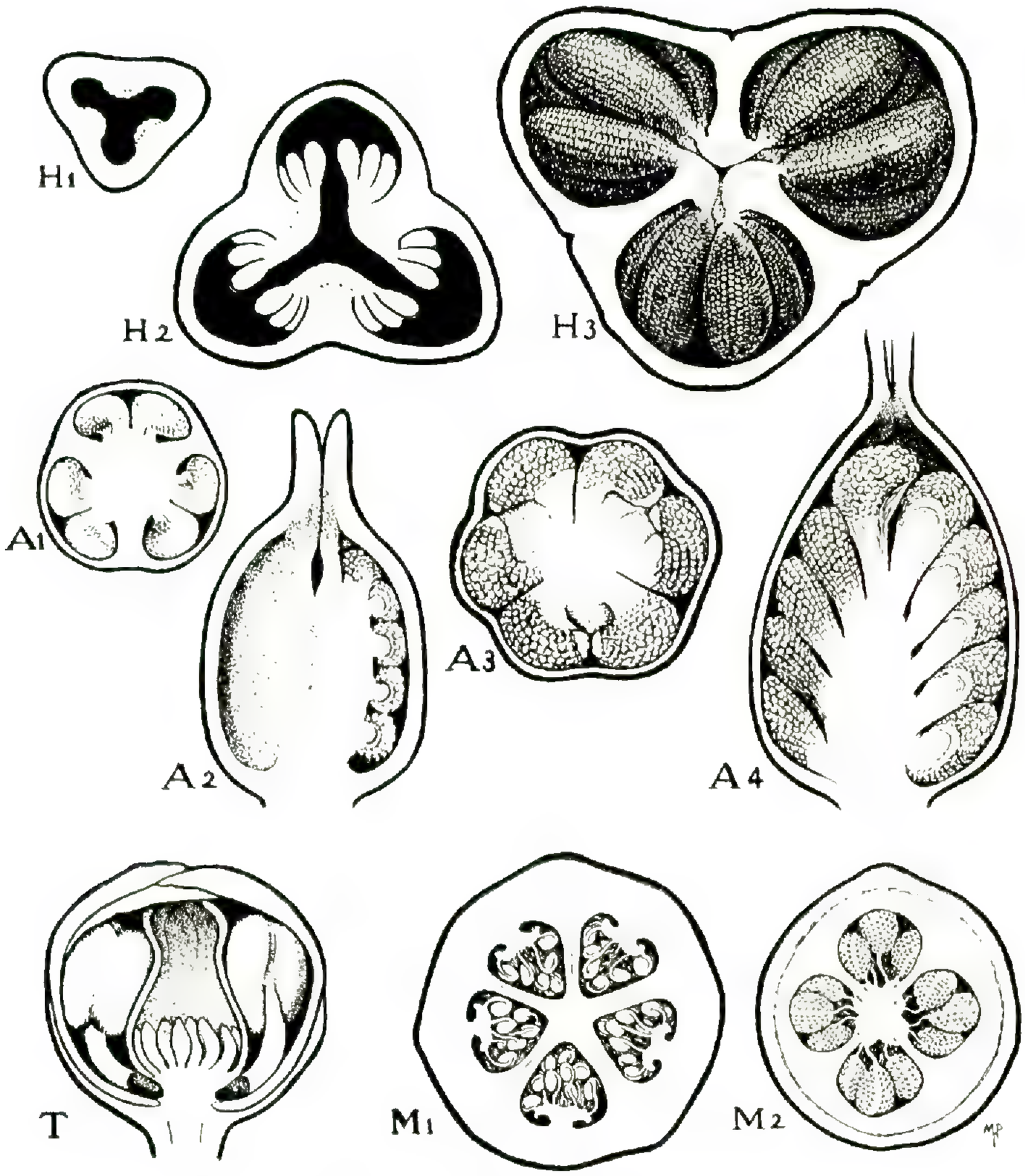

FIG. 7. Types of placentation (attachment of ovules). H, *Hypericum densiflorum;* Axile placentation in this case has developed from initial parietal placentation; H 1–2, flower buds with ovules on walls of ovary; H 3, adult flower with ovules on axis, formed by the ingrowth of the placentae. A, *Arenaria Korincana;* Central placentation here has developed from initial axile placentation; A 1–2, flower buds where ovary-walls connect with style; A 3–4, adult flower with central axis separate. T, *Tamarix pentandra;* Basal placentation with many ovules, occurring only in a few groups (probably a primitive form). M 1, *Mesembryanthemum spectabile;* M 2, *Mesembryanthemum cordifolium*, showing great difference in attachment of ovules in the same genus.

Systematic Botany

By Alfred Gundersen

The Genus Staphylea

With Mr. C. F. Doney, I have been making a study of about three hundred specimens of the genus *Staphylea* from the herbaria of the Brooklyn Botanic Garden, the New York Botanical Garden, the Arnold Arboretum, the U. S. National Herbarium, and the Missouri Botanical Garden. This genus is widely distributed in Europe, Asia, and North America. Of twenty-eight names which have been assigned to *Staphylea* four belong to other families and five to the related genus *Turpinia,* others are synonyms or included in the accepted species, leaving only eight or possibly nine distinct species.

The Classification of Dicotyledons

The study of floral structures of many species of dicotyledons has been continued, with drawings by Miss Maud H. Purdy. The drawings are dated, and we are gradually following up the study of missing parts of structures of flower buds at the proper season. Attention is being given especially to placentation and to changes in placentation as the flower develops, as illustrated in fig. 7. Eichler wrote in his *Blütendiagramme,* page 47, in 1874, "the whole question of placenta-formation merits very much a new investigation, at the same time from a developmental and systematic-comparative point of view." This holds true in 1934, sixty years after.

Hardy Species of Trees and Shrubs

With Mr. Alfred Rehder, of the Arnold Arboretum, I have continued the work on an alphabetical list of trees and shrubs based on his *Manual of Cultivated Trees and Shrubs.* The plan of the work has been somewhat revised and expanded. In this work we have been joined by Mr. Henry Teuscher, dendrologist of the New York Botanical Garden. After each species there is given the author, the year of publication, height, geographic distribution, and zone of hardiness. In case the species was first described under another genus that genus also is given. An example follows:

Symphoricarpos Juss. 1789 15 sh Caprifoliaceae *271*–3
albus (L. 1753 sub Vaccinium) Blake Sh 1m nNAm III
(S. racemosus Michx.)
microphyllus Kunth 1818 Sh 3m Mex VIII

Systematic Botany

By Henry K. Svenson

Plants of the Astor Expedition

The manuscript on the flora of the Galapagos and Cocos Islands, consisting of about eighty pages with six plates, many photographs and text figures, has been completed since early in the spring of 1933 and is awaiting publication. This manuscript does not include the large representation of ferns and fern allies, which comprise about one third of the vascular flora of Cocos and are well represented on the higher islands of the Galapagos Archipelago. I have been working on these with the cooperation of Mr. C. A. Weatherby, of the Gray Herbarium, as an additional project. It was necessary to examine specimens upon which obscure records were based, especially the plants obtained by Darwin on the Galapagos Islands during the voyage of the *Beagle*, and I accordingly went to England for the month of August, at my own expense. This collection is at the herbarium of Cambridge University, where it was made available to me by the kindness of Mr. Gray. With a single exception, all the ferns described by Sir Joseph Hooker from Darwin's collection were located. At Kew I spent a long time in looking up old records, based chiefly on collections by Capt. Wood in 1846, and the miscellaneous notations in Moore's *Index Filicum*. Much valued assistance was given by the curators, especially by Mr. Ballard, who has charge of the ferns.

While at Kew I also made a fairly thorough survey of the genus *Eleocharis*, especially with reference to the species of Africa, Australia, and South America, often poorly or not at all represented in American collections. Several types were also examined at the Linnean herbarium in London and at the herbarium at Edinburgh.

In addition to identifying *Eleocharis* for many institutions, including the U. S. National Herbarium, California Academy of

Sciences, and the Herbarium of the New York State Museum at Albany, I have also been identifying Brazilian *Cyperaceae* for the University of California at Berkeley. There has been the usual routine identification of specimens collected for the herbarium and for exchange with other institutions.

Forest Pathology

By Arthur Harmount Graves

Chestnut Breeding Work in 1933

The object of this work, which has already been set forth fully in reports of previous years (Brooklyn Bot. Gard. Record **19**: 62–67, 1930; **20**: 83–87, 1931; and **21**: 46–53, 1932) is, briefly, to obtain if possible a chestnut tree to replace the now nearly extinct native chestnut which has been killed off by the blight. Such a new stock should be both blight-resistant and of timber quality, *i.e.* capable of attaining considerable height growth. For the present, our method is to cross-pollinate the blight-resistant Japanese chestnut, a low-growing, orchard type of tree, with the susceptible American timber tree, in the hope of getting, among the offspring of these two parents, the desired combination, that is, a blight-resistant tree of the tall timber type.

During the past year the work has proceeded principally along three lines: 1. The culture of some four hundred young trees and seedlings of various chestnut species and hybrids, including the collection of extensive data on growth rates and habit tendencies; 2. The production of new hybrid nuts of Japanese and American parentage; and 3. The addition of several lots of seeds and seedlings of native American chestnut to our collections, forming the nucleus of a group from which desirable strains may be selected for future work.

1. *Culture of Chestnut Seedlings*

*Hybrids of 1932.**—Of the 189 hybrid nuts produced by the crossing of Japanese and American chestnuts in the summer of 1932, only 65 (34.3 per cent.) geminated. The reasons for this

* We have adopted the plan of naming and dating our hybrids according to the year in which the cross-pollination was effected, although, of course, the nuts do not germinate until the following season.

sharp drop in percentage of germination from the figures attained last year (over 80 per cent.) are not altogether clear. It may be due, in part, to a lack of adequate greenhouse facilities. Also, the poor viability of the seeds may have been inherent. In April and May these 65 seedlings were transplanted to the chestnut plantations on my land at Hamden, Conn. Little more than half their number—37 in all—survived the summer.

The European chestnuts (*Castanea sativa*) received in the fall of 1932 from the botanic gardens of Berlin, Geneva, and Paris, germinated well. Of the 350 nuts received, 176 seedlings (50 per cent.) are now living, 29 in the Hamden plantations and 147 in the nursery of the Brooklyn Botanic Garden. The losses at the Garden were due almost wholly to the depredations of squirrels and rabbits.

A number of seedlings have been grown from nuts of American chestnut collected in various localities and sent to us by interested persons—notably those from Virginia given to us by Miss Hilda Loines.

The Chestnut Plantation at Hamden.—Throughout the growing season considerable time and attention were given to such cultural details as pruning, cultivating, and the control of insect pests. Toward the end of the summer this year the leaves of most of the species and hybrids were attacked by aphids and mites, causing a crinkling and browning of the leaves which was especially pronounced in the latter part of August and in September. Dr. W. E. Britton, of the Connecticut Agricultural Experiment Station at New Haven, kindly identified these attacks as evidently the work of the aphid *Calaphis castaneae* Fitch and of the mite *Paratetranychus bicolor* Banks. It was noted that the thicker, leathery leaves of the Chinese chestnuts (*C. mollissima*) were almost wholly unaffected by these insects.

The area devoted to chestnut trees at Hamden is being enlarged constantly, and some of the trees there are now in their eighth year. As the plantings become more extensive and the trees more mature, the labor involved in their culture is increased, so that it would be most desirable to have the assistance of a gardener for a few days two or three times during the coming summer.

It may be of interest here to state that the plantation at Hamden

is continually exposed to infection from the chestnut blight fungus. The woods surrounding the planted trees contain frequent diseased basal shoots of native trees. This is as it should be. We are not trying to protect the trees from the blight. In order to discover whether or not our hybrids are resistant it is well to have them thus continually exposed to the disease. Eventually—perhaps in two or three years—we shall inoculate all of the older hybrids in order to secure positive evidence on this point. With two or three possible exceptions, where the seedlings have been weakened by drought or some other cause, we have not yet found any of our own hybrids affected with the blight. This is nothing unusual, since such apparent immunity is to be expected in young seedlings. Some of the older Japanese trees have suffered to a slight degree, the infection apparently following winter killing of the tips of shoots. The Chinese trees, now seven years old and in many cases over seven feet high, have remained entirely clear of the blight.

Some of the seedlings in the Hamden plantation, received from the U. S. Department of Agriculture during the years 1929–31 inclusive, blossomed in 1933, as follows:

Number of Trees	Kind	Age
1	*C. mollissima* (Chinese)	7 years
2	S–8 U. S. D. A. Hybrids (*C. mollissima* × *pumila*)	7 "
1	78636 (Japanese)	5 "
1	78627 (Japanese)	5 "
1	F. P. I. (1931) U. S. D. A.	4 "
10	*C. Seguinii* U. S. D. A.	7 "

With the exception of the shrubby *C. Seguinii*, which bears nuts regularly every year, only one nut was obtained, namely from a Japanese tree of the forest type (No. 78627) received from the U. S. D. A. in 1930.

Other Plantations.—Besides the plantation at Hamden, Connecticut, the following seedlings were given to several interested people, who had them planted on their own land, as follows:

May 5. 12 *Castanea crenata* to Miss Maud H. Purdy, Pomona, N. Y.

May 12. 12 *Castanea crenata* to Dr. M. F. Schlesinger, Monroe, N. Y.

May 13. 8 *Castanea crenata* and one pan of *C. sativa* (from Paris) to Mrs. Kenneth B. Halstead, Speonk, L. I.

The Japanese seedlings (*C. crenata*) in this case came from seed obtained in 1931 in Japan by Dr. George M. Reed.

Growth Records for 1933.—We now have a total of 455 chestnut trees at Hamden and in the Botanic Garden nursery, comprising several different species and varieties and hybrids, as follows.

Species	Number
Castanea dentata (American)	17
C. sativa (European)	182
C. crenata (Japanese)	43
C. crenata (Jap. forest type) U. S. D. A.	49
C. mollissima (Chinese) U. S. D. A.	15
C. Henryi U. S. D. A.	3
C. Seguinii U. S. D. A.	10
Folk hybrid (Jap.-Amer.) 1931	1
Hammond hybrid (Jap.-Amer.) 1931	4
Smith hybrid (Jap.-Amer.) 1931	49
Smith hybrid (Jap.-Amer.) 1932	37
U. S. D. A. (various hybrids and species received from Bureau of Plant Industry)	41
Winthrop hybrid 1931	4
Total	455

Table I, below, gives the average growth rates for the hybrids of 1931 and 1932 during the season of 1933. The phenomenal

TABLE I. GROWTH RATES OF HYBRID CHESTNUTS AT HAMDEN, CONN., 1933

Name	Number of Trees Living October	Average Height October	Average Growth
Folk 1931	1	3 ft. 6 in.	18 in.
Hammond 1931	4	3 ft. 9 in.	21 in.
Smith 1931	49	2 ft. 2 in.	14 in.
Smith 1932	37	7 in.	7 in.
Winthrop 1931	4	1 ft. 7 in.	9 in.

growth of Hammond hybrid No. 86 of 1931, recorded in my report of last year (B. B. G. RECORD 22, No. 2; p. 60) was continued in 1933, the total height growth being about equal to that of the previous year, so that it is at present about six feet high—

an unheard of growth for a two-year-old chestnut seedling. (In a coppice shoot this would not be remarkable.) Most of the trees made two seasons of growth this year, and many of the hybrids of both 1931 and 1932 made three seasons of growth during the same period. This rapid growth is doubtless to be accounted for, at least in part, by the fact that the seedlings are planted in good

FIG. 8. Chestnut bur, four-fifths natural size, containing three nuts and resulting from the cross-pollination of a pistillate flower on the Japanese tree of Mr. Paul Hammond, Syosset, Long Island, using pollen from American trees growing in the Government nursery at Bell, Maryland. (2497.)

garden soil and are kept under clean cultivation throughout the season.

2. *Hybridization Work in 1933*

For the hybridization work this year the American chestnut pollen was supplied us, as usual,* through the cooperation of the Di-

*In 1932, since the late-flowering Japanese chestnut of Mr. Renville S. Smith was the only tree worked, we were able to secure our own pollen from native shoots near Lake Mahopac, N. Y., and from New Milford, Conn.

vision of Forest Pathology, Bureau of Plant Industry, of the United States Department of Agriculture, from American chestnuts planted at the Government nursery at Bell, Maryland. For the pistillate trees, *i.e.* the female, or nut-bearing parents, we limited our work to the use of two of the more promising Japanese trees—those of Mr. Paul Hammond and of Mr. John W. Minturn, both at Syosset, Long Island—and to young shoots of American chestnut which we happened to find on the estate of Mrs. James A. Burden. The Minturn tree is a very fine specimen, one of the best in the region, but in past years we have had no success in securing hybrid nuts from it. This year, therefore, we concentrated our efforts on it. As a result, out of a total of thirty-nine hybrid nuts collected in the fall, fifteen were from the Minturn tree. Figure 8 shows, slightly reduced, one of the burs resulting from the cross-pollination of the Hammond tree. This bur, which yielded three nuts, is of unusually large size, about four inches in its median horizontal diameter. The details of the hybridization work in 1933 are summarized in Table II, below. These nuts

TABLE II. ANALYSIS OF CROSS-POLLINATIONS, 1933

	Minturn	Hammond	Burden	Total
No. of branches bagged	60 + 7 selfed	61 + 30 selfed	13	171
No. of flowers pollinated	95	76	32	203
No. of flowers developing nuts *	14	15	1	30
No. of nuts ripened	15	23	1	39

* Because of severe storms, we suffered unusual losses of obviously matured nuts.

were all planted in sand immediately after collection, and the pots placed out of doors in cold frames for overwintering.

A notable feature of our hybridization work this year was the use, for the first time, of an American tree as the pistillate parent. Extensive crossings of this type would be very desirable, but heretofore we have been limited to Japanese trees for the female parents of our hybrids, because of the scarcity of flowering American chestnuts in the environs of New York. Good sized shoots (to a

height of ten feet or more) sprouting from the bases of dead chestnut stumps are not uncommon in this region, but few of these shoots bloom, and more rarely still do they bear pistillate flowers. We were particularly fortunate, therefore, in finding near a roadside, on land of Mrs. J. A. Burden, in Syosset, wild saplings of American chestnut (really basal shoots from an old stump), the oldest of these about ten years old and twelve feet in height, bearing several pistillate flowers. These were crossed several times with pollen from the Japanese chestnut of Mr. Minturn, but evidently we misjudged the period of receptivity for the pistils of this species, since from the thirty-two flower clusters (young burs) pollinated, only one nut was matured. We hope that members of the Garden and other interested persons will cooperate in our effort to locate similar American trees at points easily accessible from Brooklyn, in order that this work may be extended, that is, using American trees as the nut-bearing parents.

Observations on Self-sterility.—Continuing our experiments of 1931 (Brooklyn Bot. Gard. Record 21, No. 2; p. 52), further data were collected on self-sterility in the chestnut. Thirty branches of the Hammond tree and seven branches of the Minturn tree, bearing both staminate and pistillate flowers, were bagged before the flowers had opened, and were left undisturbed throughout the blossoming period of the trees, thus presumably insuring self-pollination. None of these inflorescences matured nuts.

3. *Plantings of Native Chestnuts*

In order to obtain stock for future crossing experiments, and also with a view to the possible selection of disease-resistant strains, we have this fall (1933) planted 202 nuts of American chestnut (*C. dentata*) obtained from various parts of the country; many more nuts have been stratified for planting in the spring of 1934. A list of these plantings follows.

Number of Nuts	Given by	Origin	Date Planted
91 (plus ∞ stratified)	Miss Hilda Loines	Virginia	10/14/33
24 " " "	Mrs. G. Stewart Brown	Liberty, N. Y.	11/23/33
10	Miss Maud H. Purdy	Somerset (?) Co. Pennsylvania	10/19/33
37	Mr. Charles Schlesinger	Pennsylvania	10/19/33
36 " " "	Dr. H. K. Svenson	Western Pa.	11/5/33
4	Mr. J. Stuart Thomson	Snowy Mt., Pa.	10/14/33

Everyone who traveled last fall through parts of New York, New Jersey, and Connecticut adjacent to New York City must have noticed the large number of roadside stands where American chestnuts labelled "native" chestnuts were offered for sale. These brought rather high prices compared with those of the old days: at one place in New Jersey Dr. Svenson bought ½ pint for 35 cents; a pint sold for 60 cents. This high price of the nuts is interesting from at least two angles. In the first place it shows that the nuts, which were everywhere enthusiastically advertised as "native," still retain their old reputation for sweetness and general edibility, and therefore are and will be successful competitors with the imported kinds. In the second place, it shows that in our attempt to breed for a disease-resistant timber tree we should also keep in mind the edible quality of the nuts as well. It is said that the nuts offered for sale at the roadside stands are from points in the southern states where the blight has not yet (presumably) killed out all the native chestnuts.

Cuttings.—At intervals during the year a number of cuttings were taken from various chestnut species, in an effort to find a method of rooting them. Thus far, there have been no positive results.

Herbarium Specimens.—Dried specimens of various chestnut species and hybrids have been collected for a study of the leaf and twig characters, and to serve as a permanent record of the material studied.

Needs.—We are continually hampered in our work for lack of adequate greenhouse space; the poor germination of the hybrid nuts which were secured last year after many days of hard work may have been due in part to a lack of suitable greenhouse conditions. If ultimately we shall have been able to develop a chestnut tree suitable for replacing our lost American chestnut, the expense of a special greenhouse for this particular work will seem slight indeed. I know, of course, that the present is a most inauspicious time to speak of this, yet the urgency of the need is, I think, sufficient justification.

I am glad to have this opportunity to acknowledge with thanks the cooperation of the Division of Forest Pathology, U. S. Department of Agriculture, in this work. I also appreciate the in-

terest and cooperation of Mrs. James A. Burden, Mr. John W. Minturn, and Mr. Paul Hammond, the owners of the trees on Long Island.

Economic Botany

By Ralph H. Cheney

Material from the several species of coffee, growing in the tropical plant house, was utilized in a study of the chromosomes in this genus. A study to determine the formation of coffee-leaf glands is likewise in progress.

The summer of 1933 was spent at the Marine Biological Laboratory at Woods Hole, Massachusetts. Studies regarding the effect of alkaloids, especially the methylated xanthines which occur in the genus *Coffea* Linn., were conducted with reference to the animal organism.

REPORT OF THE CURATOR OF PLANTS FOR 1933

Dr. C. Stuart Gager, Director

Sir: I submit herewith my report for the year ending December 31, 1933.

Iris Plantations

Dr. Reed, in charge of Iris, reports as follows:

Many of the newer varieties of Tall Bearded Iris were added to the collection. 116 varieties were received on the basis of exchange from the following:

Mr. Harry Esty Dounce, Bayside, L. I.	4	varieties
Mrs. J. F. Emigholz, Kenwood Iris Gardens, Cincinnati, O.	26	"
Mr. Fred R. Whitney, Hudson Gardens, Germantown, N. Y.	11	"
Mr. Clint McDade, Chattanooga, Tenn.	14	"
Mr. John A. Monroe, Chula Vista, Cal.	6	"
Mr. Robert Wayman, Bayside, L. I.	25	"
Mr. John C. Wister, Philadelphia, Pa.	30	"

Mrs. Z. G. Simmons, Greenwich, Conn., sent us 17 varieties as a gift.

76 species were added to the collection by exchange from the following:

Mr. F. C. Brown, Royal Horticultural Society, Surrey, England	5	species
Dr. R. A. Harper, Ridgewood, N. J.	6	"
Mr. L. F. Hoyt, East Aurora, N. Y.	1	"
Dr. Fritz Lemperg, Hatzendorf, Steiermark, Austria	4	"
Dr. J. K. Small, New York Botanical Garden, New York City	56	"
Prof. A. E. Waller, Ohio State University, Columbus, Ohio	3	"
Dr. O. E. White, University of Virginia	1	"

Mr. S. Tanaka, Shizuoka, Japan, collected plants of 5 additional species in Japan, and forwarded them to us through the Yokohama Nursery Company.

The Oregon Bulb Farms, Boring, Ore., gave us 24 bulbs each of 25 varieties of Bulbous Iris, including Spanish and Dutch.

Three new beds were prepared on the grounds and planted to the Tall Bearded Iris; many of the newer varieties were included in these plantings.

Trees and Shrubs

During 1933 we have obtained a few additional plants from nearby nurseries. Species which can be obtained from American nurseries are now nearly all represented in our Garden. A number of trees and shrubs not obtainable in this country were imported from France (Lemoine), Germany (Hesse), and England (Veitch); also bulbs from Holland (Van Tubergen). Rare plants were obtained by exchange from the Arnold Arboretum, Boyce Thompson Institute, U. S. Department of Agriculture, from Mr. Clarence Lewis, and from the Long Island estate of Mr. Anton Hodenpyl. *Clematis* and other plants were obtained from Mr. J. E. Spingarn. Mrs. Nathan S. Jonas presented a large conservatory collection, chiefly orchids.

The Brooklyn Botanic Garden now has a comprehensive collection of trees and shrubs. Further development must be largely of species which require some special attention, for example, as to soil requirements, moisture or shade, or special winter protection. A part of the nursery has been set aside for experimenting with such plants.

From our present list of desiderata of trees and shrubs may be mentioned:

Ardisia japonica
Buckleya distichophylla
Cotinus americanus
Cornus Nuttallii
Daphne arbuscula
Daphne Giraldii
Echinopanax japonicum
Ehretia thyrsiflora
Fagus japonica
Ilex geniculata
Liriodendron chinense
Magnolia macrophylla
Nemopanthus mucronatus
Pseudotsuga japonica
Pterocarya Rehderiana
Sapindus Drummondii
Sassafras tzumu
Sycopsis chinensis

Lilacs

The lilac collection, about 250 plants adjacent to the Rose Garden on the west, has of necessity received little attention for a number of years. It was found that various preliminary maps, made before the Rose Garden was constructed, far from represent the present arrangement of the plants. Many shrubs have been moved and many service labels attached to branches have been lost due to borers and other causes. To facilitate accurate mapping of the collection, numbers have been painted on the twenty-eight Rose Garden posts, and a few small boulders have been put in various places to serve as points of reference. New maps have been made by Mr. Joseph Pollio, a CWA draughtsman. Information about plants and specimens has been correlated so far as possible under three groups: White Forms, Colored Single Forms, and Colored Double Forms. We hope to get the greater part of the collection labeled in the spring of 1934.

Viburnums

A geographical arrangement adopted last fall for this important horticultural genus much simplifies the study of the group, and enhances its educational value as an exhibit. We have at present 12 American, 3 European and 22 Asiatic species. These figures reflect, in general, the relative number of species of *Viburnum* in each of the three continents. The *Cornus* and *Spiraea* groups especially need similar rearrangement.

Maps of Trees and Shrubs

We have adopted a smaller form for our maps with many small squares. These maps are more easily carried about the Garden

and more readily remade, as is often necessary. We expect to have the sources of the plants and year of accession on typewritten lists opposite the maps; thereafter, keeping records of the woody plants will require less time.

Courses

In the spring I gave an outdoor course of ten lessons on Plant Families continued in the fall by five lessons. The spring lessons chiefly related to the structure of flowers and other characters of the higher plants. In the fall the closing lesson on "Interdependence in Plant and Animal Evolution" was given at the American Museum of Natural History.

Visits to Other Gardens

In the spring and again in the fall I visited the Arnold Arboretum at Jamaica Plain, Massachusetts. I also visited the Estate of Mr. Anton Hodenpyl, on Long Island.

Labels

I have had various consultations with a view to adopting a more permanent form of label. We have abandoned white or yellow paint on the small wooden labels in favor of black on a slightly lighter green background.

Statistical report is attached herewith.

Respectfully submitted,

Alfred Gundersen,
Curator of Plants.

Labels and Signs

Labels and signs were made by Mr. John McCallum as follows:

Galvanized iron labels for the herbaceous beds	475
Family labels for the beds	88
Lead labels for the woody plants	288
Small lead labels for local flora and rock garden	574
Small wood labels	495
Large wood labels	19
Wooden signs	42
Cardboard signs	278
Total	2,259

Also numerous miscellaneous numbers and signs.

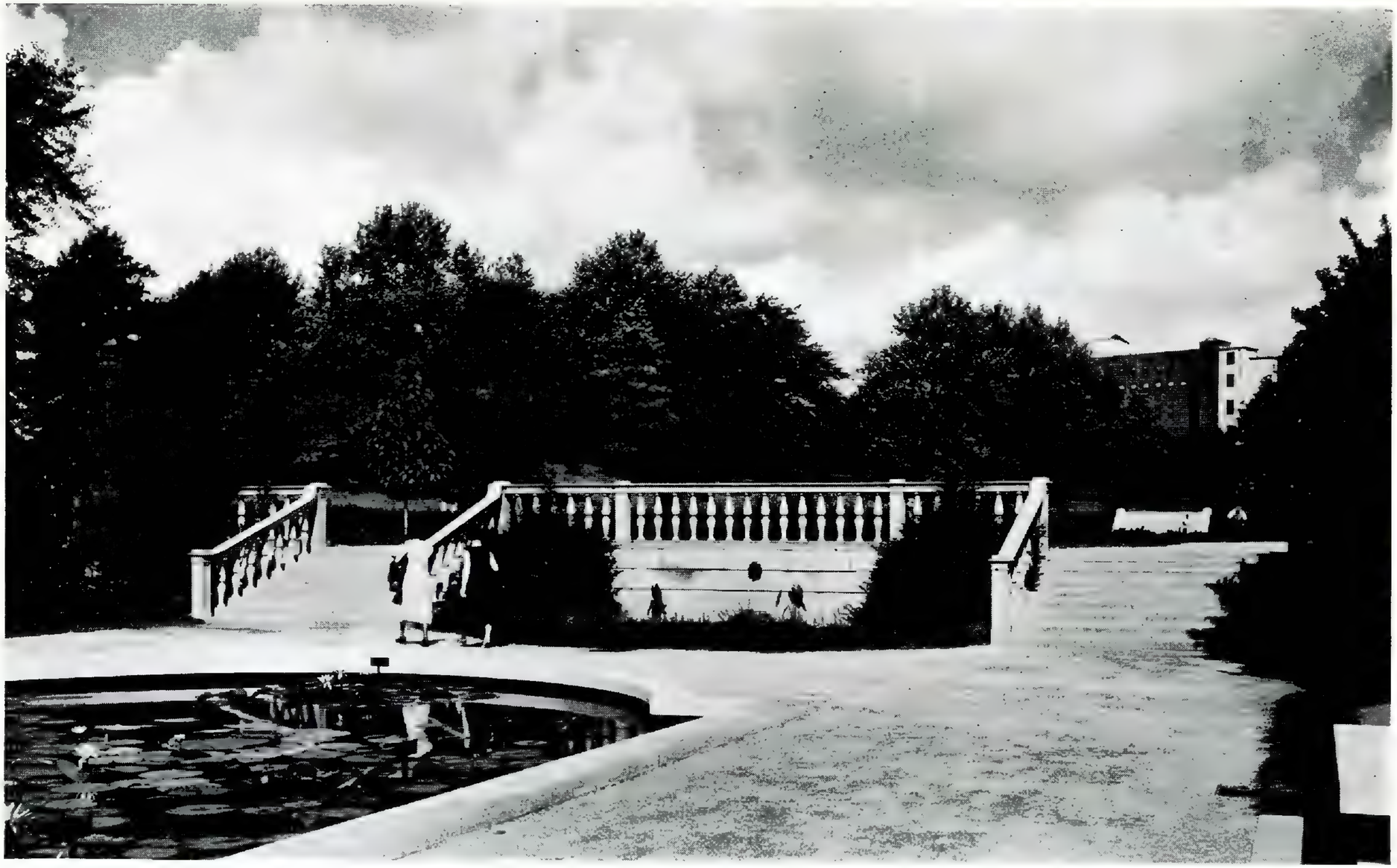

FIG. 9. Conservatory Plaza. North end, showing steps to Laboratory Plaza. The two shrubs between the steps are *Pyracantha*. (8391.)

Statistics Relating to Living Plants

Living Plants Received:

	Species or Varieties	Plants
By collection	87	1,329
By exchange	210	419
By gift	281	1,443
By purchase	289	11,671
By seed	550	550
Total	1,417	15,412

Living Plants Distributed:

To members, etc.	6	3,924
By gift	11	20
By exchange	226	226
Total	243	4,170

REPORT OF THE ASSOCIATE CURATOR OF PLANTS FOR 1933

Dr. C. Stuart Gager, Director,

Sir: I submit herewith my report for the year ending December 31, 1933.

The Herbarium

From January to March and from October to the end of December the herbarium had the services of two people from the Emergency Work Bureau. They were engaged primarily in mounting and cleaning specimens, in continuation of work which they had done for us the preceding year. The total number of plants mounted was 2,214 which brings the number of sheets in the herbarium of flowering plants and vascular cryptogams to approximately 109,000. By most botanic gardens the herbarium is considered as their most important single feature, representing as it does the basis of plant records in the publications in the library and the accumulated results of years of exploration, and providing the *only exact basis for identification of plants.*

Through the inclusion of the herbaria of the Long Island His-

torical Society dating back to the early decades of the nineteenth century and that of the Brooklyn Institute, our herbarium has much of historical interest as well as widely representative material for the routine identification of plants of the United States. There is great need and desirability of special collections, and I think it should be the policy of the herbarium to develop a few restricted groups rather than a general herbarium. During the past two years we have been especially interested in getting collections of cultivated plants; an adequate herbarium seems the only solution for the present chaotic conditions in the names and identity of cultivated herbaceous plants.

Local Flora Section

With the exception of the limestone ledge still desired for the growth of walking fern, maidenhair spleenwort, and similar rock ferns, the ecological groups may be said to have reached a certain degree of maturity. The grove of young trees planted in 1918 has taken on the appearance of a small forest, in which the interlacing branches provide good shelter for many hundreds of white trilliums, spring beauty (*Claytonia*), hepatica, and violets. Each year substantially improves the woodland conditions by increasing the shade, humus, and aeration of soil. The grove consists of trees planted about 8 ft. apart in a level well-drained area. The trees were of approximately equal size when set out, and were placed with the idea of seeing which species would survive. The rapidity of growth may be roughly seen in the following average measurements made in December 1933 of the circumference at two feet above the ground: *Liriodendron* (17.5 in.), *Quercus rubra* (17.5 in.), *Quercus velutina* (16 in.), *Betula papyrifera* (14 in.), *Fagus grandifolia* (11 in.), *Acer saccharum* (10.3 in.), *Pinus Strobus* (10.5 in.), *Betula lenta* (10 in.). The total number of trees was 65. Of these species *Liriodendron* is by far the fastest growing, although it is probably exceeded in rate of growth by the sweetgum (*Liquidambar*). *Acer saccharum, Pinus Strobus,* and *Betula lenta* appear unable to stand the strong competition of the other species. *Betula lenta* and *B. lutea* grow well when removed from competition.

Except for hemlocks and flowering dogwoods which are still

needed throughout the section for ornamental effects, the tree-planting program has been carried out. Within the next decade we should have small stands of red maple, beech, white pine and pitch pine in a flourishing condition, each group accompanied by the characteristic herbaceous plants.

Extension of the boundary fence northward to the pathway coming from Flatbush Ave. has made the section seem more natural and has considerably increased the area. The soil of much of this newly acquired addition has been improved by turning in peat.

The brook, made in the fall of 1932, has become a natural feature of the landscape and provides moisture for the growth of ferns, Virginia cowslip (*Mertensia*) and many species of violets.

In the sand area there has been gratifying success in the growth of two species of *Hudsonia*, *Corema*, *Tephrosia*, *Arenaria caroliniana*, *Euphorbia Ipecacuanhae*, native species of *Helianthemum*, etc. together with mass plantations of *Viola pedata*. It has been interesting to observe the variations of flowering-time in the native species of blue-eyed grass (*Sisyrinchium angustifolium*, *S. atlanticum*, *S. arcuicola* and *S. mucronatum*), and it is expected that the opportunity for similar close observations will give us much information on the relationship of native species within puzzling genera.

The bog has completed its third year and the plants show no sign of losing vitality. Pine-barren plants such as curly-grass (*Schizaea pusilla*), pipeworts (*Eriocaulon compressum* and *decangulare*), *Lophiola*, *Lachnanthes*, *Xyris*, *Drosera filiformis*, *Helonias bullata*, *Sabatia lanceolata*, and several species of orchids are thriving in the wet peat which they share with northern representatives, *Calla palustris*, cottongrass (*Eriophorum spissum*), *Kalmia polifolia*, rhodora (*Rhododendron canadense*), and species of *Carex*. In the adjoining peat-and-sand area *Pyxidanthera* and turkey beard (*Xerophyllum*) are growing luxuriantly. The moist bank adjacent to the bog has for two years supported a good growth of bunchberry (*Cornus canadensis*), creeping snowberry (*Chiogenes*), *Linnaea borealis* var. *americana*, and *Dalibarda repens*, plants confined to mountain regions of our area.

Practically all the desirable plants native within 100 miles of

FIG. 10. Local Flora Section. View facing northwest, showing pool and sand area. *Heliopsis helianthoides* at the right. September 28, 1933. (8508.)

New York City with the exception of the parasitic and semi-parasitic species and those of saline habitats are now growing in the Local Flora Section.

Classes

With the help of Miss Rusk, Instructor at the Garden, four sessions on the Native Plants of the New York Region were held (May 16–June 13) at the Local Flora Section and at Coytesville, New Jersey. Beginning January 9th a series of twelve weekly lectures constituting a course of General Botany was given at the Horticultural Society of New York. A repetition of this course was begun on November 13th. An additional series of twelve laboratory sessions on the Identification of Plants, beginning November 13th at the Horticultural Society of New York, was undertaken with the assistance of Miss Rusk.

Statistics from the herbarium will be found appended to this report.

Respectfully submitted,

Henry K. Svenson,
Associate Curator of Plants.

Herbarium Material Borrowed for Study

University of California, Berkeley	28
Mr. C. C. Deam, Bluffton, Indiana	7
Gray Herbarium, Cambridge, Mass.	45
Dr. Fred. J. Herman, Temple University	2
Leningrad, Academie des Sciences de l'URSS	6
Dr. Costa Lima, Jardim Botanico do Rio de Janeiro	16
Missouri Botanical Garden, St. Louis, Mo.	42
New York Botanical Garden	155
New York State Museum, Albany	346
Mr. J. W. Thompson, Seattle, Wash.	38
U. S. National Herbarium, Washington, D. C.	95
Total	780

Herbarium Material Loaned to Other Institutions

Dr. N. C. Fassett, University of Wisconsin	43
Mr. Alfred Friedman, Brooklyn College of Pharmacy	18
Dr. Ada Hayden, Iowa State College	112
Mr. Albion R. Hodgdon, Gray Herbarium	236
Mr. John T. Howell, California Academy of Sciences	2

Dr. H. M. Jennison, University of Tennessee	13
Metropolitan Museum of Art (for exhibit)	20
Mr. Harold N. Moldenke, New York Botanical Garden	9
Mr. T. Chalkley Palmer, Media, Pa.	1
Dr. B. C. Tharp, University of Texas	19
Total	473

Herbarium Accessions and Distribution

Phanerogamic Herbarium

Accessions:

By Gift:

Dr. J. A. Drushel	76	
Mr. Max Elwert	1	
Mrs. Mary Holtzoff	105	
Mr. B. A. Krukoff	54	
Mrs. Stephen Loines	1	
Miss Fanny A. Mulford	232	
Dr. Henry K. Svenson	88	
Mr. M. Tatewaki	2	559

By Exchange:

Dr. N. L. Britton	2	
University of California	40	
California Academy of Sciences	10	
Botanic Garden, Cluj, Roumania	177	
Mr. C. C. Deam	234	
Dr. D. Demaree	312	
Dr. N. C. Fassett	1	
Dr. M. A. Johnson, Rutgers University	41	
Miss E. M. Kittredge	10	
New York Botanical Garden	940	
Professor T. Tanaka, Taihoku Imperial Univ., Japan	200	
Mr. J. K. Underwood	3	
U. S. National Herbarium	30	
Mr. Louis C. Wheeler	7	
Mrs. E. G. Whitney, N. Y. State Museum	1	
Mr. Percy Wilson, New York Botanical Garden	1	2,009

By Purchase:

Miss E. M. Kittredge	42	42

By Collection:

Dr. H. K. Svenson	1,379	1,379
Total		3,989

Distribution:

By Exchange:

Gray Herbarium	17	
Mr. Ludlow Griscom, Museum Comparative Zoology	3	
Dr. Frederick Grover, Oberlin College, Ohio	235	
Mrs. Edward K. Harrison	12	
Mr. J. T. Howell, California Academy of Sciences	4	
Mrs. Julia Latimer	22	
Mr. T. Chalkley Palmer	1	
U. S. National Museum	3	
Mr. C. A. Weatherby, Gray Herbarium	1	298
Total		298

Cryptogamic Herbaria

Accessions:

Fungi:

By Exchange:

Dr. Tr. Savulescu, Bucharest, Roumania	512	
United States Department of Agriculture	171	683

By Purchase:

S. Tanaka, Shizuoka, Japan	130	130
Total		813

Other Cryptogams:

By Purchase:

Fr. Verdoorn, Leiden, Holland	100	
Dr. Abel J. Grout, Newfane, Vt.	21	121

By Exchange:

Mr. Aaron J. Sharp, University of Tennessee	191	191
Total		312

No. of Specimens Distributed

By Exchange:

Mr. E. B. Bartram	1

Seed Packets Received:

By collection	133
By exchange	2,525
By gift	35
By purchase	112
Total	2,805

Seed Packets Distributed:

By exchange	4,367
To members	825
Total	5,192

REPORT OF THE HORTICULTURIST AND HEAD GARDENER FOR 1933

DR. C. STUART GAGER, DIRECTOR.

Sir: I submit herewith my report for the year ending December 31, 1933.

PERSONNEL

The gardening force (nine men) was the same as in 1932, except that we had the services of Mr. Henry Funk from June 5th until the end of the year. Mr. Funk worked without pay for the sake of the experience and his services are greatly appreciated. The laboring force and guards at the gates were maintained substantially as in 1932.

LABOR PAID FOR BY CHARITABLE ORGANIZATIONS

Throughout the year fifty-nine men, whose wages were paid by charitable organizations, worked for a total of 3,955½ days, as follows:

Brooklyn Bureau of Charities	45 men	3,757½ days
Emergency Work and Relief Bureau	12 "	144 "
Brooklyn Ass'n for Improving the Condition of the Poor	1 "	35 "
Good Will Industries	1 "	19 "
	59 men	3,955½ days

GENERAL SYSTEMATIC SECTION

Because the plants in the Umbelliferae (Carrot Family) present an unattractive appearance throughout a large part of the year, it was desirable to move the planting from its conspicuous situation opposite the Washington Avenue south entrance and near the walk, to a position to the west where it is partially screened by shrubs belonging in the Cornaceae. Accordingly, three beds near

the Brook were made in the spring for the accommodation of this Family.

In order to obtain better conditions for the gentians, the bed was dug out to a depth of two feet and replaced with new soil.

As the plants in the Hydrophyllaceae (Hydrophyllum, Nemophila, Phacelia, etc.) failed to thrive owing to its sunny location, new quarters were prepared for this family in the shade of nearby Catalpas. The Plantaginaceae, for which there was previously no adequate provision, were planted in the bed vacated by the Hydrophyllaceae.

The area occupied by Viburnum was greatly extended—the necessary space being gained by the removal of "filler" material on the adjacent border mound. In the re-arrangement necessitated by this move, opportunity was taken to plant the shrubs in three groups according to their geographical origin, viz. Europe, Asia, and America.

The receipt of a gift of forty boxwood plants in the fall served as a reminder that we had for a long time been debating the desirability of displaying the Buxaceae (Boxwood and Pachysandra) in a more effective and attractive manner. It was decided to proceed at once with the extension and regrouping of this Family. Accordingly, two new beds were made, each of about 600 square feet. By combining all available species and varieties from the nursery and grounds with the gift, it was possible to adequately furnish these beds.

Six hundred bulbs in thirty varieties of "Ideal" Darwin tulips, the gift of J. J. Grullemans & Son, Lisse, Holland, were planted to take the place of "run-down" varieties in the Liliaceae beds. It may be interesting to record that this gift resulted from the favorable impression made by our display of Crocus species and varieties at the International Flower Show in March.

Local Flora Section

An additional area of over five thousand square feet was prepared for planting by digging in about seventy bales of peat moss.

About 275 square feet of flagstone walk was laid and about 100 square feet of ash walk (held together by bituminous emulsion) was made in the vicinity of the southeast entrance.

Trenches were dug for nearly 200 feet of irrigation pipe, which was installed by our own men.

The planting accomplished is noted in the report of the Associate Curator of Plants.

Ornamental Planting

One hundred plants of European Hornbeam were planted on either side of the walk near the north Flatbush Avenue entrance. In order to give the trees a fair chance, the soil was dug and manured to a depth of two feet in two strips three feet wide, each 150 feet long. It is proposed to train these trees to form a pleached alley.

Seven new peony beds, accommodating about 250 plants, were made at the easterly end of the Museum Embankment. The material to furnish these beds was obtained from the peony planting in the Conservatory Garden.

Five thousand plants of English Ivy, propagated here, were set out under the trees on Boulder Hill where the shade is too dense to permit the growth of lawn grass.

The narcissus planting, between the fence of the Experimental Plot and the walk, was removed, the border widened three feet, and planted with various groups of May flowering tulips. Forty-nine varieties were planted—one hundred bulbs of each.

Three new iris beds were made. Two, in the Ecological Section, are each over 800 square feet in area; and one, near the brook west of the Rosaceae, over 400 square feet.

About ninety azaleas in twenty-two varieties were planted to replace dead and sickly specimens in the planting near Empire Boulevard entrance. The soil in this area is not suited to the growth of azaleas and should be removed and replaced with new soil.

Eight young Magnolia trees and a dozen Clematis plants were set out to frame the Laboratory Plaza planting.

Conservatories

In order to accommodate the gift of Mrs. Nathan S. Jonas of over four hundred orchid plants, house No. 3, which contained a miscellaneous collection of tropical plants, was emptied and con-

FIG. 11. Aquarium. One of eight installed in Conservatory House No. 8 in March, 1931, to show plants suitable for aquaria. (8545.)

verted into an orchid house. To make room for the plants, it was necessary to bridge over the walks between the center benches and to construct stepped staging on both side and center benches.

Wind Storm

On August 23d, the Garden was visited by a terrific wind and rain storm. Practically the whole force of gardeners and laborers was occupied for an entire week in cleaning up and repairing the damage resulting from this storm. In most cases, the injured trees and shrubs were not broken off but merely toppled over because the rain-soaked ground failed to hold the roots. This made it possible to pull most of the casualties back to their normal vertical position and stay them with guy wires. It is really amazing that so little permanent injury was done. The only trees of consequence that it was not possible to restore were the Paulownia in the Systematic Section and a large Platanus on Boulder Hill.

Miscellaneous

Fifteen hundred rooted cuttings of Japanese honeysuckle were planted to clothe the new fence around the Experimental Plot.

About three hundred concrete drain "tiles" were made during the winter to be used for the purpose of underdraining the Conservatory Garden.

Two hundred yards of walk near the north Flatbush Avenue entrance was surfaced with Cow Bay Grits held together with a sealing coat of bituminous emulsion.

The old road northeast of the Japanese Garden, which was subject to erosion during every rainstorm, was removed and a new road constructed. This road is 130 feet long and 15 feet wide, made with a stone foundation and a surface of ashes bound with a bituminous emulsion. The new alignment and grade necessitated the construction of a low stone wall on one side which was continued as a stone edging along the fence up to the north entrance of the Japanese Garden—three hundred feet in all.

About five hundred feet of barbed wire fence was replaced at the top of the Museum Embankment.

Requests for Information

Information on request was supplied as follows:

By telephone 298, an increase of 64 per cent. over 1932
In person 206, an increase of 61 per cent. over 1932
By letter 242, an increase of 27 per cent. over 1932

These 746 appeals ranged from requests for prescriptions for sick rubber plants to that of a Brooklyn hospital for the identification of a plant (from a telephoned description) so that a child who had been poisoned from eating a portion of it might be correctly treated. It was easy to decide that the plant in question was the castor-bean. A rather unusual inquiry was from a writer who wanted to know about the possibilities of utilizing insectivorous plants in the home and elsewhere in the control of insect pests!

Exhibits

At the Twentieth Annual International Flower Show, the Botanic Garden's Exhibit of Methods of Plant Propagation was awarded the Gold Medal of The Garden Club of America "by the unanimous opinion of the judging committee because of its great value in stimulating knowledge and interest in gardening." This exhibit occupied a space of 30 feet by 12 feet, donated by the Flower Show Committee. Preparation was started more than a year ahead and involved a tremendous amount of work. A description of the exhibit is contained in Brooklyn Botanic Garden *Leaflets*, Series XXI, No. 1, April 5, 1933. In connection with the exhibit, a nineteen page *Leaflet*, "Methods of Plant Propagation" (Brooklyn Botanic Garden *Leaflets*, Series XXI, No. 2–6, April 26, 1933), was prepared, which contains a survey of practices used in the multiplication of plants.

At the same Flower Show, we were awarded a Silver Medal for a labeled collection of about forty species and varieties of Crocus.

At the November 15th meeting of the Horticultural Society of New York, we exhibited

One Vase "Green Rose," Rosa chinensis viridiflora
(Award of Appreciation)
and
One Vase Idesia polycarpa
(Award of Commendation)
At the meeting of December 20th, we exhibited
Display of Insectivorous Plants
(Botanical Certificate)

Cooperation with Other Institutions

We cooperated with the Metropolitan Museum of Art by providing much of the living plant material used in connection with the "Exhibition of Plant Forms in Ornament" held at the Metropolitan Museum from May 8 to September 10. The first shipment, which required a moving van, was made on May 4 and included such plants as Acanthus, Laurel, Date Palm, European Grape, Olive, and Pomegranate. Thereafter, sixteen additional shipments were made at approximately weekly intervals. The total number of plants supplied was 570, with 41 bunches of cut flowers and branches. Transportation charges were assumed by the Metropolitan Museum of Art.

Seed and Plant Distribution

In connection with the International Seed Exchange, 5,192 packets of seeds were distributed to foreign and domestic botanic gardens and to other institutions and individuals during 1933.

Surplus plants to the number of 4,170 were distributed to institutions and Botanic Garden members.

Personal Activities

I conducted the following "Courses for the General Public" at the Botanic Garden:

Plants in the Home; five talks with demonstrations.
The Fundamentals of Gardening: four of six periods.
Advanced Course in Gardening; seven of ten periods.

I conducted three sessions of a series of twelve weekly lectures, constituting a course of General Botany, which is being given at the Horticultural Society of New York.

I acted as one of the judges for the Federated Garden Clubs of New York State at the International Flower Show, Grand Central Palace, on March 20 and on March 23; Long Island Flower Show of Amateur Gardeners, at Pratt Estate Oval, Glen Cove, June 21; Brooklyn Flower Show, at the Academy of Music, on October 17 and on October 20.

I again conducted the "Garden Guide" column of the New York *Sun*. In this connection, over 1,040 letters were sent out. This work was done, with the permission of the director, outside of regular Garden hours with stenographic assistance and other expenses paid for by the *Sun*.

I served as chairman of the Organization Committee of the proposed American Rock Garden Society, which held several meetings in New York during 1933.

Respectfully submitted,

MONTAGUE FREE,
Horticulturist and Head Gardener.

REPORT OF THE CURATOR OF PUBLIC INSTRUCTION FOR 1933

DR. C. STUART GAGER, DIRECTOR.

Sir: I submit herewith my report for the year ending December 31, 1933.

GARDEN ATTENDANCE

The attendance for the year 1933, as registered at the entrance gates, was 1,315,847, as against 1,307,964 for 1932, a gain of about 8,000. Although this is only a slight increase for the year, it is worthy of note that an attendance much exceeding the record occurred during the months of April, with a total of 205,410, and June, with a total of 181,887. The largest attendance ever before recorded for April was 146,664 in 1931, and for June, 162,960, in 1932. The combined total for April and June of this year was 309,624, about one quarter (23½ per cent.) of that of the whole year, and almost equal to the attendance for the entire year of 1916, when records of this sort first began to be kept, namely 314,-

990. The attendance at the Garden for the week-end May 6–7 was 33,958. This was the second largest week-end figure ever recorded. (On May 14–15, 1932, the attendance was 38,304.) The combined attendance at classes and lectures was 126,934, as against 128,982 last year.

The attendance at the Conservatories exceeded all past records. During the month of April over 29,000 people visited the collections housed there. This is by far the highest monthly attendance ever recorded. The total for the year was 139,544, as against 123,036 last year. This represents an average of over 11,000 persons per month. I believe that this increased attendance at the Conservatories is accounted for, at least in part, by the completion of the attractive Laboratory Plaza. Visitors who come to inspect this and its various interesting features are attracted to the Conservatories, which are close at hand. The appended table gives the details of attendance month by month.

ATTENDANCE AT THE GARDEN DURING 1933

	Jan.	Feb.	Mar.	Apr.	May	June	July
At regular classes	1,402	1,100	2,508	3,067	3,572	2,775	17,200
At visiting classes	469	564	3,088	5,552	15,130	4,638	45
At lectures to children ...	409	490	2,067	3,046	10,050	3,616	40
At lectures to adults	0	180	90	502	1,060	443	32
At conservatories	7,643	7,335	7,978	29,062	20,374	12,986	7,869
At grounds	72,370	67,518	73,011	205,410	219,517	181,887	105,609

	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Totals
At regular classes	15,000	3,544	1,508	2,252	1,449	55,377
At visiting classes	0	25	4,590	6,057	1,271	41,429
At lectures to children ..	0	205	2,491	3,347	1,100	26,861
At lectures to adults	0	40	195	600	125	3,267
At conservatories	9,874	9,176	12,099	9,488	5,660	139,544
At grounds	95,087	87,852	102,920	73,065	31,601	1,315,847

School Service

During the first half of the year Miss Rusk carried on the work of supplying study material to the high schools, junior high schools, and colleges. She was able to do this in addition to her other work, because of assistance from the Emergency Work Bureau. The work has grown so that without such assistance it could not go on. Therefore, after consultation with officials of the Board of Education, it was decided to make a small charge for materials supplied to the schools, since the latter received an allowance from the City for expenditures of this sort. A price list of materials was prepared and sent to all the schools when they opened in early September.

Miss Julia E. Best, formerly Assistant in Connecticut College, came to the Garden to take over this part of the work, with the title of "School Service Assistant." The table given herewith presents some of the data for this service during the past three years. An interesting point shown is that with this new departure the

	1931	1932	1933
Total no. of requests for the year	387	398	421
Total no. of requests for January–August	209	215	238
Total no. of requests for September–December	178	183	183
No. of petri dishes filled during year	5482	5727	4888
No. of petri dishes filled January–June	2873	3664	4265
No. of petri dishes filled September–December	2609	2063	623

number of requests for material in 1933 actually increased.

The decrease in number of petri dishes results partly from a complete loss of requests from certain schools, and partly from a reduction in number of petri dishes per school. The schools which no longer ask for petri dishes include 8 high schools, 4 of which are known to be preparing their own, 9 junior high schools, and 1 parochial school. We are very glad of the relief thus afforded this department, our object being to meet school needs not otherwise provided for.

Adult Classes and Courses

New Courses.—The popularity of the new course in "Flower Arrangement" (A23), given in January, 1933, and sponsored by the Woman's Auxiliary, was attested by the large enrollment—108

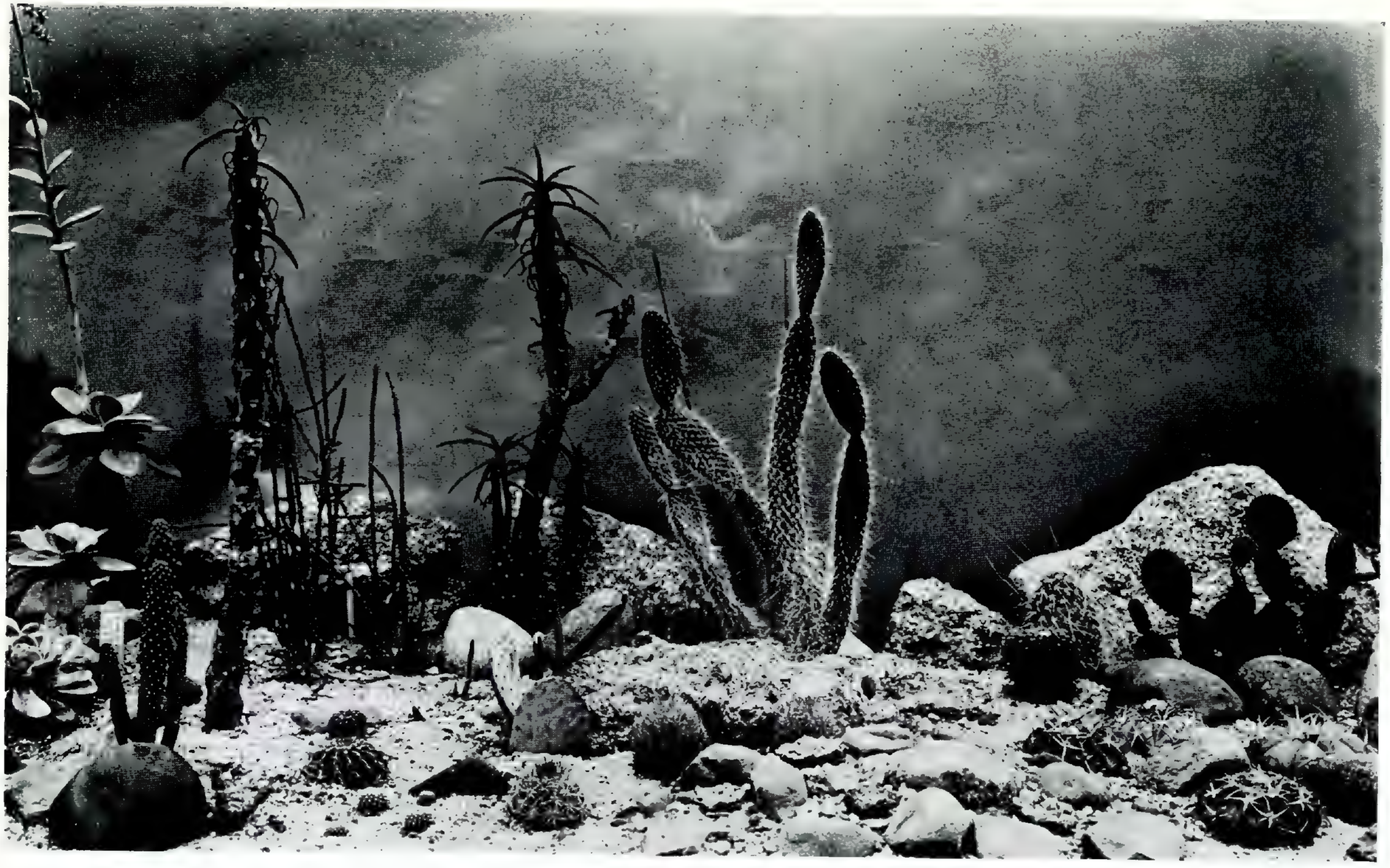

FIG. 12. Portion of Cactus exhibit, Conservatory House No. 6. *Opuntia* (6 species), *Echeveria metallica*, *Echinocactus horizontalonius*, *E. Grusoni*, *Ariocarpus fissuratus*. (8548.)

persons. Miss Mary Averill, Mrs. William H. Cary, and Miss Maude Mason were the lecturers. Another new course was "The Child and his Garden" (A24), conducted by Miss Ellen Eddy Shaw and given in January and February. This was designed particularly for parents and their children.

The "Fundamentals of Gardening" (A25), although described in the Prospectus for the first time in 1932–3, had been given in 1932 under the name of "Elementary Gardening" and announced in a circular issued in the fall of 1931. Eighty-eight persons enrolled in this course this year. The course was given by Miss Shaw and Miss Dorward.

Seventy-two persons attended one or more of the "Three lectures and demonstrations for teachers" (A27), offered this fall for the first time, the lectures being given by Miss Shaw, Miss Jenkins, and Miss Miner.

Courses on Trees and Shrubs.—One hundred and eight persons registered for this course—86 for the spring part and 22 for the fall. The spring group was divided into three sections of about 28 each. This is now listed (beginning with the 1932–33 Prospectus) as a "B" course, that is, one of those designed particularly for teachers, who may thus earn credit for higher teaching licenses. One reason why there was such a large enrollment in the spring, in contrast to the small registration this fall, was that the course was also listed in last year's Prospectus as an "A" course, free to members of the Garden.

General Botany (B1).—This course was conducted by Miss Rusk, as usual, the subject for this year (to Sept. 1933) being the higher plants. Beginning in September the lower plants have been the topic. The arrangement of alternating lower and higher plants in successive school years began in 1931.

The course for nurses in training (D1) was given in the spring and fall under my direction, as usual. In the fall the class studied sixty-three species of medicinal plants, using the plants in the outdoor plantations, in the Conservatories, and in the herbarium. The classes came from Kings County, Prospect Heights, and St. Johns Hospitals—44 students in the spring and 77 in the fall. At the conclusion of both spring and fall courses a lecture on drugs was given by Mr. Jonathan Gordon, a graduate of St. Johns Col-

lege of Pharmacy, class of 1932. This lecture dealt with the methods by which pharmacists recognize drugs macroscopically and microscopically, the preparation of drugs, tinctures, fluidextracts, etc., and the biological and chemical methods of standardization of important drugs.

It would be a feature of distinct advantage, not only to these classes but also to the general public, if at some time in the near future a small area such as the triangular plot just west of the Rose Garden could be devoted exclusively to medicinal plants. Such collections are an important and integral part of many European botanic gardens.

The total number of persons registered in the adult courses for 1933 was 823, as against 908 last year. The figures for the last few years are as follows: *

Year	Persons Registered
1929	764
1930	802
1931	823
1932	908
1933	823

Flower Days

The flower days were continued as usual this year. These are informal occasions at which the members of the Garden and their friends are afforded an opportunity to see, under guidance, those collections which are of outstanding interest, and to view them when they are at the height of their flowering period. Several days in succession were devoted to the Japanese Iris, under the guidance of Dr. Reed. This was a departure from the usual custom, and has the advantage that it offers additional opportunity to those who might not be able to attend if only a single day is selected. The exercises were well attended, averaging about 150 for each occasion. The social arrangements were in charge of the Woman's Auxiliary, assisted by the young women of the Garden personnel. We would like to avail ourselves of this opportunity to acknowledge our indebtedness to both of these groups

* These figures differ from those of previous reports because registration in the full-year courses is here counted according to the calendar year rather than the school year as formerly.

for their continued interest and invaluable services. A list of the "Days" for the year 1933, with the leaders, follows.

Tuesday, March 21. Crocus Day. Mr. John C. Wister, President of the American Iris Society and Director of the Arthur Hoyt Scott Horticultural Foundation at Swarthmore College.

Friday, June 2. Iris Day. Dr. George M. Reed, Curator of Plant Pathology, Brooklyn Botanic Garden.

Tuesday, June 13. Rose Garden Day. Mr. Montague Free, Horticulturist, Brooklyn Botanic Garden.

Tuesday, Wednesday, and Thursday, June 20, 21, and 22. Japanese Iris Days. Dr. George M. Reed.

Tuesday, October 10. Fall Rose Garden Day. Mr. Montague Free.

Exhibits

1. *Methods of Plant Propagation.*—At the International Flower Show, Grand Central Palace, Manhattan, March 20–25, 1933. The Horticulturist will give a more detailed report on this exhibit, of which he had entire charge. This department sent out descriptive announcements of the exhibit to the biology departments of all New York high schools. An account of the exhibit was also prepared and sent to the principal horticultural journals.

2. *Exhibit at Herold's Pharmacy.*—In June, 1933, we supplied the following specimens of living and dried plants for an exhibit of drug plants at Herold's Pharmacy, 837 Franklin Avenue.

Hamamelis virginiana	*Prunus serotina*
Lobelia inflata	*Datura Stramonium*
Atropa Belladonna	*Cinnamomum camphora*
Veratrum viride	*Piper nigrum*
Gaultheria procumbens	*Olea europea*

Also mounted specimens of the following: *Digitalis purpurea, Cinchona rubra, Papaver somniferum.*

3. *Exhibit at Namm's Store.*—October 2–11. As a part of the series of exhibits entitled "Brooklyn Days," given by Namm's Store, we were invited to install an exhibit representing activities of the Brooklyn Botanic Garden. At this exhibit bulb planting was featured, and under Miss Shaw's direction one of the young women employees of the store conducted a window demonstration of the various steps to be taken for the correct planting of bulbs

both indoors and out. The principal other items of the display were: model of the children's gardens, terrarium, Wardian case, material distributed to schools, results of research in genetics, publications of the Garden.

Editorial Work and Publicity

As usual, I continued to serve on the editorial board of the *American Journal of Botany*, as editor of the Plant Section of General Biology for *Biological Abstracts*, as editor of the Brooklyn Botanic Garden *Contributions*, and as associate editor of the *Bulletin* of the Torrey Botanical Club. As editor of the Brooklyn Botanic Garden *Leaflets* I report that eight numbers were issued, as follows:

No. 1. The Brooklyn Botanic Garden Exhibit of Methods of Plant Propagation, International Flower Show (N. Y. City), March 20th–25th, 1933. By Montague Free.
No. 2–6. Methods of Plant Propagation. By Montague Free.
Nov. 7–8. Hay Fever—a Study in Applied Botany. By August A. Thomen, M.D.

We continued the method that we have followed for the last ten years, of sending news releases telling of Garden events of particular interest to the public. For 1933, seventeen releases containing twenty-nine articles were mailed to the principal metropolitan newspapers. In addition, releases dealing particularly with the activities of the Woman's Auxiliary of the Garden were sent to the press by the Brooklyn Publicity Bureau. A total of 1,495 clippings of articles relating to the Brooklyn Botanic Garden were received, as against 1,564 last year.

Miscellaneous Items

Personal Activities of Other Members of the Department.—During the summer Miss Hester M. Rusk, Instructor, collected and preserved a large number of specimens of weeds of the New York region, with a view to making a study of them during the winter. She also attended Ohio State University during the second term of the summer quarter, particularly for the purpose of observing methods of teaching botany. In December she attended

the meetings of the A. A. A. S., and the Botanical Society of America in Boston. In July and August Miss Hilda Vilkomerson, Curatorial Assistant, attended a six weeks course on the Taxonomy of Vascular Plants conducted by Professor K. M. Wiegand in the Summer School of Biology of Cornell University.

Postcard Bulletins.—During the year postcard bulletins were sent to members of the Garden early in March telling of the seed catalogs available for consultation in the library; on March 17, telling of the Garden's exhibit of plant propagation at the International Flower Show; on April 3, announcing a demonstration of methods of pruning roses in the Rose Garden; on May 20, telling of the distribution of over 1,000 young chrysanthemum plants to members; and on October 20, acquainting members of the distribution of 1,000 divisions of named peonies.

Staten Island Inspection Work.—In company with Mr. W. Lynn McCracken, Secretary of the Staten Island Conservation Commission, I have inspected the areas on Staten Island which are included in the regional planning for the island, and have made suggestions regarding the location of the proposed botanic garden for Staten Island.

Lantern Slides of European Gardens.—From photographs I took on my trip to Europe last year, I have had made and colored one hundred and thirty-three lantern slides. These comprise views of interesting plants, floral displays, and other noteworthy features of public parks and botanic gardens in Europe.

Broadcasts.—Beginning in October, I have broadcast over WNYC regularly, every two weeks, talks dealing with some feature of the Brooklyn Botanic Garden.

General Information.—As in former years, this department has answered numerous inquiries by telephone, in person, or by mail, for information or advice concerning plants.

Research Work.—I have continued the work of hybridizing Japanese and American chestnuts with a view to securing a disease-resistant chestnut tree suitable for timber. A report of this work will be found on pp. —.

Respectfully submitted,

ARTHUR H. GRAVES,
Curator of Public Instruction.

REPORT OF THE CURATOR OF ELEMENTARY INSTRUCTION FOR 1933

DR. C. STUART GAGER, DIRECTOR.

Sir: I hereby present my annual report for the Department of Elementary Instruction for 1933.

I would like to call your attention to a few outstanding facts in relation to different phases of the work of this Department.

In our work with children, including all its branches of service, we have contacted approximately a million young people.

In Brooklyn alone we have reached 204 elementary schools, about 90 per cent. of the entire number in the Borough; 7 junior high schools, 23 high schools, 1 university, 15 private schools, and 23 parochial schools.

On January 7, a class was started called "The Child and His Garden." This was for both mothers and children and had a registration of 22 children and 13 mothers. It was conducted on Saturday mornings before the regular Saturday morning work began.

During January and February special courses were given for Berkeley Institute and Brooklyn Ethical Culture School. This is the first year we have carried on special group studies during the early months of the year. The work for the Ethical Culture School continued throughout the entire spring term and ended with a remarkably fine exhibit set up in our rotunda. This exhibit demonstrated how the nature work they took with us had been the keynote of all their work for the term. The work with Berkeley continued through most of the spring. From this special series planned for private schools, partly an outgrowth of the course, "The Child and His Garden," and partly through our own work, courses were planned in the fall for Berkeley, Packer, Ethical Culture School, Miss Kirk's School, and the Prospect School. These courses varied in length form two to eight weeks and were highly satisfactory.

In early February a class was started for new children who wished to join the Boys and Girls Club. These children were on probation, becoming acquainted and preparing themselves for the regular spring classes.

There were 218 boys and girls registered in the spring classes, which this year were divided into two distinct units, one beginning the 25th of March and running for six weeks, taking up lessons in planting of seeds, testing of soil, and acquaintance with the grounds in the spring, while the second unit began on the 22d of April and worked entirely upon their plans and studies of vegetables and flowers preparatory to the outdoor garden project. These classes rotated from one instructor to another for better acquaintance with instructors and to carry on the Departmental work in a richer way.

June, July, August, and September were spent in the outdoor garden with a registration of 235 students.

In our fall classes, the registration figure was 185.

Our teachers' classes were carried on as usual. This year two series of special free lectures for elementary schools were given at the Botanic Garden, one in the spring and one in the fall. At our spring series 18 elementary schools from Brooklyn and 14 from Queens participated, with Abraham Lincoln High School and Kings County Hospital also represented. In the fall were registered 32 elementary schools from Brooklyn, 6 from Queens, Wadleigh High School, the Manhasset School, and Miss Beard's School of Orange, N. J.

I would like to draw to your attention the enormous amount of detail which is involved in the work of this Department, detail which has grown tremendously in the last few years and which has been handled efficiently and cheerfully with the same sized staff. Much of this work might easily be handled by someone less experienced and less well-trained than the instructors in the Department. Two thousand seven hundred ninety-three plants have been given out to 119 different institutions, including elementary schools, high schools, junior high schools, colleges and universities, private and parochial schools, and other institutions. Six hundred eight plants were placed in 74 different classrooms. More than 3,000 surplus perennials and annuals raised in our greenhouses were supplied to 33 different institutions. Twenty-five collections of house plants varying in number from 8 plants to 20 were distributed to different schools, not for decoration, but for study.

The Department set up 19 exhibits. These were viewed by about 500,000 people, and included exhibits put up in schools, at the Children's Science Fair, and at the Namm Store.

More than 1,200 people received instruction in our greenhouses. In January of last year our greenhouses had in them about 5,000 plants. These plants, representing stock material, have been raised entirely by the Department this year. Most years we purchase some new stock, but this year every effort has been made to reduce the expenditure, which, of course, has increased the amount of detail work.

A course called "Fundamentals of Gardening" was given by Mr. Free and myself, I giving the two greenhouse lessons in the course.

During the spring we took over the planning and execution of the spring docentry for outside visiting clubs. This took up a great deal of time and energy of the members of the Department. From fifteen volumes of the *National Geographic Magazine* which had been presented to us, instructors in the Department sorted out, by subject, articles pertaining to plant life and geographic lore and bound up 72 volumes in small editions.

The penny-packet seed work was carried on as usual. It might be of some interest to note that about 1,000 pounds of seed are bought, envelopes filled, and seed orders packed and counted out. This work takes most of the time of one of the instructors from November to May, and during the summer when a great deal of the filling of seed is done by the boys and girls of our outdoor garden.

The children's garden was carried on as usual, and it is to be noted that, notwithstanding the financial situation in our country, more children left the city for long vacations, for camp and country, than ever before in the history of the garden, thus making garden attendance irregular. Through a gift of money from Mrs. Charles E. Perkins, it was possible for us to have some extra help on the Silver Pin work which is one interesting feature of our summer's work. A new feature of our garden this year was a little course in the study of flower arrangement. This group of students kept the house supplied with flowers and made up bouquets every week. Flowers were sent up to the Labora-

tory Building for the office and the library, and besides that, bouquets went home to the children's parents. July 12 was the annual visiting day for parents. Each mother received some lavender raised in our garden and each father a flower for his buttonhole.

Other groups visited us during the summer—a class from New York University and a group of women from Cedarhurst, where a garden according to the plan of our garden was started by the mothers of two of our garden boys who come from there. This was started in connection with one of the local elementary schools, and in the fall, the Curator visited this garden at their final meeting, and presented some of the prizes.

The Shakespeare Garden had no new additions, but was carried on effectively. Twenty bronze and twelve silver medals were presented at our annual party in the fall. Pictures were taken of different operations in the spring and during the summer and fall by our photographer, Mr. Buhle, and a very excellent new set of lantern slides was made and colored. This was financed by a gift made sometime ago by the Woman's Auxiliary.

During the spring the Head Garden Teacher gathered together material for an exhibit representing all phases of our children's work. This is ready to be set up at a minute's notice.

In May the Plant, Flower and Fruit Guild of Brooklyn presented a sum of money to buy hydrangeas for the urns placed in front of the children's garden house. These were presented and dedicated on May 5 in loving memory of Mrs. M. C. Plough, former secretary of the Brooklyn Plant, Flower and Fruit Guild.

In November we invited the schools having school gardens to meet at the Garden for an annual survey of their work. At this time a child delegate from each school spoke, telling of some unusual feature in his own school garden. There were forty schools invited to attend this meeting.

The number of conferences this year has been far greater than during 1932. Over 200,000 children were reached through conferences with teachers and principals.

Dr. William G. Vinal of the School of Education, of Cleveland, Ohio, took one of our regular nature study periods (B2) this spring.

Because of the conditions of the times I shall not present to you any needs from this Department or any requests for extra help or for expenditures.

The first week in July I attended the National Education Association meetings at Chicago and took charge of the meetings of the Department of Science Instruction of which I am President. In October I was invited to go to Rockford, Illinois, to speak before the Winnebago County Institute of Teachers on the methods by which we carry on our children's work. At the December meeting of the American Nature Study Society with the American Association for the Advancement of Science in Boston, Miss Jenkins, of this Department, spoke on "By-products of a Children's Garden." The new set of lantern slides, of which I have spoken before, had their christening at this time.

I was asked to serve on the Advisory Board of the Horticultural College of Southern California, affiliated with Pasadena Junior College; and as chairman of the Nature Craft Committee of the Brooklyn Camp Fire Girls. I also continue to act as Honorary Secretary of the National Plant, Flower and Fruit Guild. During the year I wrote thirty-eight articles for the Garden Page of the New York *Sun,* and eight articles for *McCall's* Magazine.

Since 1933 represents twenty years of my work in the Department of Elementary Instruction, I would like to mention a few facts concerning this Department. Its broad plans were laid down by the Director before I was chosen to start the work. It has been my great privilege to take these plans and without any change in the lines originally laid down to interpret and to enlarge upon them as work and opportunity dictated.

In looking back over the history of these twenty years, I would like to review some of the early years. I came to the Garden on October 1, 1913. On October 6 my first class was taught, a class from the Girls' High School, seventeen girls to be instructed in the indoor planting of bulbs. This represents the beginning of visiting classes, and from that figure of 17 girls in the fall of 1913 we come to the fall of 1933 with an attendance at visiting classes of more than 68,000. There was one greenhouse in 1913. In it, during that month of October I gathered together for lecture purposes 8 plants. We now have three instruction greenhouses

built according to our own plan, with plants ranging in number from 5,000 to over 10,000 or 12,000 in the season when we have young seedlings.

Those eight plants referred to represent the beginning of work for adults. A short lecture course was started on October 28, 1913. This course was held in what is now the children's club-room, the only lecture room we had at that time. Now our courses for adults are many and varied.

In January, 1914, teachers' classes were started with seven young women, the beginning of all the work we now offer to elementary and high school teachers. We have 355 teachers registered in our teachers' classes for 1933.

Seed work was started in 1914, when we filled about 25,000 packets of seed, stamped the name of the seed on a plain Manila envelope, and used thimbles as fillers. We now have an adequate, well-stocked, well-arranged seed-room where over a million packets of seed are filled annually.

From a single principal's comming to discuss plans for his school with me in October of that first year, the year of 1933 represents a total number of conferences reaching 9,000.

The children's outdoor garden was started in 1914 on the piece of land now occupied by our main building and the strip of land upon which the instruction greenhouses now stand. This land was used for 60 children coming from the practice school of Pratt Institute and as a practice garden for junior and senior students of Pratt Institute Kindergarten Department. The main garden, with its 80 children, was the garden training school for the young women students at the Brooklyn Botanic Garden. It was the mother of our present garden which accommodates over 200 boys and girls.

There are two main aims in our children's work, one to instill in the minds of numberless children a love and appreciation of the outdoors; the other, a hope that from these boys and girls, especially from those in our Saturday morning classes, there may develop a contribution to science from some outstanding young person in the field of botany. Twenty years is not long enough to tell this story; but at the present time we have the following of our young people connected definitely with the subject of

botany—one an Assistant in Botany at Columbia University; one an Assistant in the Research Department of the Brooklyn Botanic Garden; one completing a research project for his Ph.D. at Harvard University; one engaged in research work for the Port of New York Authority with the Federal and State Departments of Agriculture and Commerce. Among college students, we have one in landscape design at Syracuse University; one in the College of Agriculture at Cornell University—and I would like to mention here that in his case the practical work he had done in his student days at the Brooklyn Botanic Garden was accepted at Cornell University as practical work toward his degree. Still another student is working in agricultural chemistry at Long Island University. At St. Francis College is a young man preparing to be a teacher of botany. We have had one young woman who has shown outstanding ability in the field and has recently received a scholarship from the Farm and Garden Association for Amherst Agricultural College. Of three young women who started to prepare in botany to enter a career of education, one is married, and two have been obliged to teach other subjects because of the demands of the times. Most of these students are recipients of the Alfred T. White Scholarship, provided for by the late Alfred T. White to encourage young people in the study of botany. There have been fourteen of these young people, and out of the fourteen, nine are in the field of botany or in an allied field. Six boys and girls at present registered in our Saturday classes are planning to enter the field of botany.

The long period of attendance of some of our boys and girls at the Garden is noteworthy. I have in mind a lad who came here at five, continued with us until he graduated from New York University, and still, as a senior in the Dental College of the University of Pennsylvania, comes to see us in his holidays. We have this year two seniors at Princeton University, one of whom came to us when he was eight years old and continued until he left for college. It is no unusual thing for us to have boys and girls who register almost in babyhood and continue to come until they reach college age. One of the Alfred T. White Scholarship recipients, a graduate of St. Joseph's College and now a Laboratory Instructor, came at the same early age, stayed with us through her

college years, and has never broken her definite working relationship with us. The same thing is true in some of our teachers' classes, that year after year, many teachers come back for the pleasure and enjoyment of these classes.

This would perhaps be a fitting occasion for me to express thanks to the Trustees, the Governing Committee, to the Director of this Garden for the untrammeled opportunities I have had in my twenty years of work at the Brooklyn Botanic Garden.

Respectfully submitted,

ELLEN EDDY SHAW,
Curator of Elementary Instruction.

REPORT ON THE LIBRARY FOR 1933

DR. C. STUART GAGER, DIRECTOR.

Sir: Because of the continued absence of the librarian, on account of illness, the report on the library for 1933 is submitted by the assistant in charge.

ACCESSIONS

During the year 1933, 455 volumes and 613 pamphlets have been added to the collection, aggregating 17,906 volumes and 14,100 pamphlets, a total of 32,006 pieces. Of these, 157 volumes and 329 pamphlets have been received as gifts, in addition to the current numbers of 88 periodicals. The following are especially noteworthy:

Given by their respective authors:

Cary, Katharine T. and Nellie D. Merrell. Arranging flowers throughout the year. New York, 1933.

Ikeno, Seiitiro. La Verkaro botanika . . . Tokyo, 1933.

White, Alain and B. L. Sloane. The Stapelieae. Pasadena, Calif., 1933.

Given by:

Mr. Herman Becker.

Schlecter, R. Orchideen. Berlin, 1915.

Brooklyn Botanic Garden Boys' and Girls' Club.

Wallace, Alfred Russel. Palm trees of the Amazon. London, 1853.

FIG. 13. Overlook at north end of Rose Garden. View facing southeast. September 16, 1933. (8544.)

Brooklyn Botanic Garden Woman's Auxiliary.

Anonymous. Moribana. (Modern influence in flower arrangement.) Tokyo(?), 1933(?).

Hine, Mrs. Walter R. Arrangement of flowers. New York, 1933.

Estate of Dr. Arthur Hollick.

New York Academy of Sciences. Annals. Vols. 1–31. 1879–1929.

New York Academy of Sciences. Transactions. Vols. 1–11. 1881–1892.

Staten Island Association of Arts and Sciences. Proceedings. Vols. 1–7. 1907–1918.

Miss C. Julie M. Husson.

Le Bon Jardinier. Paris, 1885. 3 vols. Illustrations by Decaisne and Herincq.

Miss Hilda Loines.

Kado Zenshu. (On Japanese flower arrangement.) Vols. 2, 4, 6, 10. Tokio, 1933.

A complete list of donors will be found in Appendix 1.

Fortunately for the collection the number of periodicals received through exchange with our own publications has materially increased this year. The loss of certain institutions and titles from our list, as explained in the last annual report, was a temporary one and we have added a few new names. We have now a total of 756 publications on an exchange basis, nearly 100 more than in 1932, and 68 more than in 1931. This covers the discrepancy between the number received as gifts in 1932 (105) and in 1933 (88). The total number of serial publications is at present 979, an increase of 76. Of the 455 volumes added, over 200 were sets or runs completing periodicals and 44 were for use in the Boys' and Girls' Club Room and Garden House.

LIST OF SOME IMPORTANT ACCESSIONS

Autograph Letters

Gray, Asa. Vries, Hugo de.

Books

Autran, Eugène and Durand, Théophile. Hortus Boissierianus. Genève, 1896.

Candolle, A. P. de. Plantes rares du Jardin de Genève. Genève, 1829. Author's presentation copy. Contains a letter and inscription to Mlle. Anastatia de Klustine, dated 20 Nov. 1830. Letter signed A. P. de Candolle.

Chaney, R. W. and Sanborn, E. I. The Goshen flora of west central Oregon. Washington, D. C., 1933.

Courtois, Richard. Commentarius in Remberti Dodonaei Pemptades. 1833.

Crescenzi, Petrus de. De agricultura vulgare. Venice, 1511. (Third Italian edition.) From the library of William Morris, with his bookplate.

Dal'Horto, Garcia. Dell' historia dei semplici aromati. Venice, 1597.

Darlington, C. D. Recent advances in cytology. Philadelphia, 1932.

Dioscorides, Pedacios. De materia medica libri sex. Venice, 1518. Second edition of Dioscorides in Greek.

Dioscorides, Pedacios. Opera quae extant omnia. Ex nova interpretatione Jani-Antonii Saraceni. . . . [Lugduni et Frankfort], 1598.

Dobell, Clifford. Antony van Leeuwenhoek and his "little animals." Amsterdam, 1932.

Dodoens, Rembert. Cruydeboeck in den welcke die gheheele historie, dat es tgheslacht. . . . Antwerp, 1554. (First edition.)

Eisai. Hanoshobu Zufu. (Series of 100 paintings of Iris, copied from the original by Bunkio Matsuki, by permission of the Imperial Library, Ueno Park, Tokyo.) 1930.

Dorf, Erling and Webber, I. E. Studies of the Pliocene paleobotany of California. Washington, D. C., 1933.

Evelyn, John. Directions for the gardiner at Says-Court. . . . Nonesuch Pr., 1932.

Gabrielson, I. N. Western American alpines. New York, 1932.

Gerarde, John. Catalogus arborum, fruticum, ac plantarum . . . in horto Johannis Gerardi . . . nascentium. London, 1599. Second edition of the earliest catalogue of an English garden.

Gray, L. C. and Thompson, E. K. History of agriculture in the southern United States. 2 vols. Washington, D. C., 1933.

Guilliermond, Alexandre and others. Traité de cytologie végétale. Paris, 1933.

Hanmer, Thomas. The garden book of Sir Thomas Hanmer, Bart. London, 1933.

Hedwig, Joanne. Filicum genera et species. . . . Lipsiae, 1799.

Hedwig, Joanne. Theoria generationis . . . plantarum cryptogamicarum. . . . Petropoli, 1784.
Heidel, W. A. The heroic age of science. Washington, D. C., 1933.
Higgins, Vera. The study of cacti. London, 1933.
Humboldt, Alexander von and Bonpland, Aimé de. Plantae aequinoctiales. . . . 2 vols. Paris, 1808–09.
Hurst, C. C. The mechanism of creative evolution. Cambridge, 1932.
Jacobson, H. P. Fungous diseases. Springfield, Ill., 1932.
Jacquin, N. J. Miscellanea Austriaca. . . . Vienna, 1778–81. 2 vols. in 1.
Jussieu, A. L. de. Genera plantarum. . . . Paris, 1789. (First edition.)
Laurie, Alex and Chadwick, L. C. The modern nursery. . . . New York, 1931.
Linné, Carl von. Bibliotheca botanica. Editio nova. Halae, 1747.
Linné, Carl von. Systema naturae. Lugduni Batavorum, 1756.
Miquel, F. A. G. Annales musei botanici Lugduno-Batavi. 4 vols. Amsterdam, 1863–68.
Miyoshi, Manabu. Atlas of Japanese vegetation. 15 pts. Tokyo, 1905–14.
Praeger, R. L. Sempervivums. London, 1932.
Read, C. B. Fossil floras of Yellowstone National Park. Washington, D. C., 1933.
Robbins, W. W. and Pearson, H. M. Sex in the plant world. New York, 1933.
Sansome, F. W. and Philp, J. Recent advances in plant genetics. Philadelphia, 1932.
Schaeffer, J. C. Fungorum qui in Bavaria . . . nascuntur. V. 1–2. Ratisbon, 1762–63. (First edition.)
Targioni-Tozzetti, Ottaviano. Istituzioni botaniche. Firenze, 1802. 3 vols. (Second edition.)
Tornabene, Francisco. Hortus botanicus. . . . Catinae, 1887.
Turck, F. B. The action of the living cell. New York, 1933.
Tusser, Thomas. Tusser redivivus. London, 1710.
Vickery, H. B. and others. Chemical investigation of the tobacco plant. Washington, D. C., 1933.
Wallace, A. R. Island life. London, 1880. (First edition.)
Watt, George. Dictionary of economic products of India. V. 2. Calcutta, 1889. The personal copy of the author, fully annotated. Contains an autograph letter to Professor Watt, signed "Prof. Flückiger."
Watt, George. Rhea or China grass. (Agricultural Ledger.) Calcutta, 1898.

Periodicals

Botanische Zeitung. V. 1–68. Set completed.
Fedde. Repertorium specierum novarum regni vegetabilis. V. 1–33. Complete to date.
Kühn-Archiv. V. 1–32 (to date). Set completed.
Nature. V. 1–132 (to date). Set completed.
Zeitschrift für pflanzenkrankheiten. V. 1–8. (We have also V. 18–43, to date.)

Special Work of the Library

The reduction of the budget and of special library funds meant a corresponding loss in the number of books purchased, so the volume of general routine was somewhat lessened. No binding of books or periodicals was attempted until the last week of the year, when we were able to send about 300 volumes to the binder.

Two workers from the Emergency Unemployment Relief Committee were kept busy through the winter, and one other has been with us the entire year. In addition to these, a volunteer worker, a graduate from a library school, needing experience, came four days a week from October to December. With this help the library assistants covered the regular routine and in addition accomplished the following special work:

1. An inventory of the pamphlet collection was taken and the pamphlets moved to the lower stack room.

2. The Pre-Linnean collection was checked and a special list made.

3. About 2,000 catalogue cards were re-typed as the old subject headings had been written in red ink, and these were copied in black, to conform to our present custom.

4. Cards were made for biographical material in certain periodicals, continuing the work of 1932.

5. The author indices for *Botanical Abstracts,* Vols. 12–15, partially made last year, were completed and are now available for reference in MS. form.

6. The scheme of classification for the lantern slides, worked out by the librarian with the cooperation of the staff, was adopted and applied, and the slides are now filed by subject. As this phase of the work belongs in another department, little was required from the library at this time except advice on the principles and application of subject headings and classification.

7. For a short time the library had the services of a binder from the Emergency Unemployment Relief Committee and a number of volumes were re-backed and mended. It was unfortunate that he was laid off after only a few weeks work. We could keep this man busy practically on full time, thereby reducing our bills for regular (*i.e.* outside) binding.

8. Having a trained worker gave us the opportunity of re-

classifying the section of monographs of Systematic Botany. A member of the scientific staff assisted in assigning family names, and the changing of numbers on cards and books of the entire group has been completed.

9. Assistance was given in the making of various bibliographies during the year. Material was assembled, from other libraries as well as our own, checked and summarized, for a paper by the Director on the effect of radium rays on plants (a resumé of . . . papers from 1901 to 1932), for a lecture on botanical literature, given by him before the New York Library Club; for an article on roses, rose culture, and rose gardens, which the horticulturist planned as a number of the Brooklyn Botanic Garden RECORD (not yet published), and for one on plant propagation, published in Brooklyn Botanic Garden *Leaflets*, Ser. 21, No. 2–6, April 26, 1933. A long list, prepared by the Metropolitan Museum of Art, on the literature of sources for botanical illustration, was checked and our holdings added, in connection with an exhibit at the Museum of plant forms in ornament.

10. Books, illustrations, seed catalogues, etc., were laid out for inspection on the special flower days observed by the Garden; and for a meeting of the executives of the Garden Club of America we exhibited a small group of books showing the development and history of botanical illustration.

REFERENCE WORK

During the year we answered over five hundred reference questions (*i.e.* questions which required checking and searching for material) by mail and personally from members of the Garden and others who wished information on many aspects of botanical and horticultural science. Students of all ages came to prepare assignments, teachers to obtain information and material for lectures, amateur gardeners for advice on the planting and care of flowers, the staff for lists of books, illustrations, identification of plants, and elusive citations. It should be noted that all projects, practical, educational, and scientific, planned by any department of the Botanic Garden, eventually require research work in the library, reviewing existing literature of the subject. Thus the library becomes increasingly useful with each new development.

Needs of the Library

As reported last year, another trained worker is needed, since the smooth functioning of the library depends to a very large extent on the prompt and accurate filing of material, adequate cataloging, and immediate attention to many small details that seem to take a disproportionate amount of time. Wherever possible, this work has been simplified and curtailed, but there is still more than can be properly accomplished by a staff of two persons.

It seems hardly necessary to repeat that funds are urgently needed for the purchase of new books and the binding of old ones. In checking over desiderata we find that items amounting to over $6,000 have been listed during the last three years, from various catalogues, all necessary and most of which were requested by users of the library. Several long runs and sets of periodicals were completed in 1933, increasing the usefulness of these particular titles, but many more are still awaiting purchase. The subscription prices of all foreign periodicals have risen, as the dollar has dropped in value, and more of our small allowance must be used for these in order to keep our sets unbroken.

The constant use of our serials, both by readers in the library and by other institutions to which we lend them, is proof of their value.

Interlibrary Loans

During 1933, 80 volumes were loaned to: Brooklyn Museum Library; Buffalo Museum of Science; Carnegie Institution of Washington, Department of Genetics, Cold Spring Harbor, L. I.; Columbia University Library; Massachusetts Horticultural Society, Boston; Metropolitan Life Insurance Company, New York; New Jersey Agricultural Experiment Station, New Brunswick; New York Botanical Garden Library; New York Horticultural Society; Rockefeller Institute for Medical Research, New York. Loans were also made to individuals from the library of the American Fern Society (deposited here), in accordance with the arrangement with this Society.

We borrowed 60 volumes from: American Museum of Natural History; American Geographical Society, New York; Dr. George Beatty, Brooklyn; Brooklyn Public Library; Columbia University

Library; Library, New York State College of Agriculture, Ithaca, N. Y.; Massachusetts Horticultural Society, Boston; Massachusetts State College Library, Amherst; Medical Society of the County of Kings, Brooklyn; New York Botanical Garden Library; U. S. Department of Agriculture Library, Washington, D. C.

The statistical report follows.

Respectfully submitted,

EMILIE P. CHICHESTER,
Library Assistant in Charge.

STATISTICAL REPORT ON THE LIBRARY

ACCESSIONS

	Autograph Letters	Portraits	Volumes	Pamphlets	Parts (Including Periodicals)
Exchange	0	0	20	85	3,590
Gift	119	38	157	329	834
Publication	0	0	0	154	45
Purchase	1	2	278	45	889
By binding	0	0	0	0	0
Total	120	40	455	613	5,358

Total number of volumes in library, December 31, 1932	17,451
Number of volumes added during 1933	455
Total number of volumes in library, December 31, 1933	17,906
Total number of pamphlets in library, December 31, 1932	13,487
Number of pamphlets added during 1933	613
Total number of pamphlets in library, December 31, 1933	14,100
Total number of volumes and pamphlets in library, December 31, 1932	30,938
Net increase of volumes and pamphlets during 1933	1,068
Total number of volumes and pamphlets in library, December 31, 1933	32,006

AMERICAN FERN SOCIETY COLLECTION

Number of volumes, December 31, 1932	36
Number of volumes added during 1933	3
Total number of volumes, December 31, 1933	39

Number of pamphlets, December 31, 1932	156
Number of pamphlets added during 1933	6
Total number of pamphlets, December 31, 1933	162

Serials and Periodicals

(Including only those of which numbers were received in 1933)

Subscription	128
Gift	88
Exchange	756
Publication	7
Total	979

Cataloging

Books, Pamphlets, and Serials cataloged	1,127
Total number of cards typewritten and filed	1,666

Printed Cards

Torrey Botanical Club index cards on file, December 31, 1932	44,785
Filed during 1933	1,286
Total, December 31, 1933	46,071
Catalogue en fiches de la Bibliographie Technique et Agriculture Tropicale, Institut Colonial de Marseille, December 31, 1932	9,693
Number of cards received during 1933	380
Total, December 31, 1933	10,073

Miscellaneous

Number of users of the library	3,494
Books lent to members of the staff	1,208
Books lent to other institutions	80
Books borrowed from other institutions	60

FINANCIAL STATEMENT FOR 1933

I. Tax Budget Accounts

1530	*Personal Service: (Regular Employees)*	
1531	" " *(Temporary Employees)*	
	Appropriation	$ 69,266.00
	Expended	69,266.00

Other Codes than Personal Service:

Code 1532	Fuel Supplies:		
	Appropriation	$ 2,500.00	
	Transferred from Department of Plant and Structures 2768	982.50	$ 3,482.50
	Expended		3,482.50
Code 1533	Office Supplies:		
	Appropriation		$ 400.00
	Expended		400.00
Code 1534	Laundry, Cleaning and Disinfecting Supplies:		
	Appropriation		$ 130.00
	Expended		130.00
Code 1535	Botanical and Agricultural Supplies:		
	Appropriation		$ 2,000.00
	Expended		2,000.00
Code 1536	Motor Vehicle Supplies:		
	Appropriation		$ 100.00
	Expended		100.00
Code 1537	General Plant Supplies:		
	Appropriation		$ 300.00
	Expended		300.00
Code 1538	Wearing Apparel:		
	Appropriation		$ 1.00
	Expended		1.00
Code 1539	Office Equipment:		
	Appropriation		$ 50.00
	Expended		50.00
Code 1540	General Plant Equipment:		
	Appropriation		$ 1,000.00
	Expended		1,000.00
Code 1541	General Plant Materials:		
	Appropriation		$ 1,000.00
	Expended		1,000.00

Code 1542	Repairs and Replacements:		
	Appropriation	$ 2,580.00	
	Transferred from Department of Plant and Structures 2768	700.00	
	Transferred from Board of Child Welfare 2113, Fixed Charges and Contributions	259.94	$ 3,539.94
	Expended	3,539.94	
Code 1543	Light, Heat and Power:		
	Appropriation	$ 500.00	
	Expended	500.00	
Code 1544	Telephone Service:		
	Appropriation	$ 500.00	
	Expended	500.00	
Code 1545	Carfare:		
	Appropriation	$ 60.00	
	Expended	60.00	
Code 1546	Expressage and Deliveries:		
	Appropriation	$ 200.00	
	Expended	200.00	
Code 1547	General Plant Service:		
	Appropriation	$ 400.00	
	Expended	400.00	
Code 1548	Contingencies:		
	Appropriation	$ 50.00	
	Expended	50.00	
Summary of Tax Budget Accounts:			
	Appropriated		
	Personal Service		$ 69,266.00
	Other Codes		
	Original Appropriation	$ 11,771.00	
	Supplemental (by transfers)	1,942.44	13,713.44
	Total		82,979.44
	Expended		$ 82,979.44

II. Private Funds Accounts

1. *Endowment Fund* ($50,500.00) *Restricted:* *

Income Account:		
Income 1933		$ 2,240.94
Transferred to Endowment Increment Fund	$ 224.09	
Transferred to Special Contributions	2,016.85	2,240.94
		$ 0.00

2. *Life Membership Fund* ($7,000.00) *Restricted:*

Income Account:		
Income 1933		$ 293.44
Transferred to Endowment Increment Fund	$ 29.34	
Transferred to Annual Membership Account	264.10	293.44
		$ 0.00

3. *George C. Brackett Library Fund* ($500.00) *Restricted:*

Income Account:		
Income 1933		$ 22.19
Expended	$ 21.17	
Transferred to Endowment Increment Fund	1.02	22.19
		$ 0.00

4. *Benjamin Stuart Gager Memorial Fund* ($13,417.20) *Restricted:*

Income Account:		
Balance, January 1, 1933	$ 4.16	
Income 1933	595.44	$ 599.60
Expended	$ 366.12	
Transferred to Endowment Increment Fund	59.53	425.65
Balance, December 31, 1933		$ 173.95

5. *Martha Woodward Stutzer Memorial Fund* ($10,000.00) *Restricted:*

Income Account:		
Balance, January 1, 1933	$ 432.32	
Income 1933	443.75	$ 876.07
Expended	$ 712.02	
Transferred to Endowment Increment Fund	44.38	756.40
Balance, December 31, 1933		$ 119.67

* Restricted funds are those limited by terms of gift, bequest, or solicitation, to the scientific and educational work of the Garden.

6. *Mary Bates Spalding Fund* ($2,697.00) *Restricted:*

Income Account:		
Balance, January 1, 1933	$ 119.70	
Income 1933	119.68	$ 239.38
Expended	$ 120.00	
Transferred to Endowment Increment Fund	11.96	131.96
Balance, December 31, 1933		$ 107.42

7. *Alfred T. White Fund* ($243,149.27) *Restricted:*

Income Account:		
Income 1933		$ 10,789.73
Transferred to Endowment Increment Fund	$ 1,078.97	
Transferred to Special Contributions	7,110.76	
Transferred to Tuition & Sales, Elem. Instr.	200.00	8,389.73
Balance, December 31, 1933		$ 2,400.00

8. *A. Augustus Healy Bequest* ($9,798.31) *Restricted:*

Income Account:		
Income 1933		$ 434.78
Transferred to Endowment Increment Fund	$ 43.48	
Transferred to Special Contributions	391.30	434.78
		$ 0.00

9. *Robert B. Woodward Bequest* ($25,000.00) *Restricted:*

Income Account:		
Income 1933		$ 1,109.37
Transferred to Endowment Increment Fund	$ 110.94	
Transferred to Special Contributions	998.43	1,109.37
		$ 0.00

10. *Alfred T. White Memorial Tablet Fund* ($3,889.85) *Restricted:*

Income Account:		
Income 1933		$ 172.60
Transferred to Endowment Increment Fund	$ 17.26	
Transferred to Special Contributions	155.34	172.60
		$ 0.00

11. *Brooklyn Institute Centennial Fund B. B. G. Share* ($30,000.00) *Restricted:*

Income Account:		
Income 1933		$ 1,331.25
Transferred to Endowment Increment Fund	$ 133.12	
Transferred to Special Contributions	1,198.13	1,331.25
		$ 0.00

12. *John D. Rockefeller, Jr., Fund* ($250,000.00) *Restricted:*

Income Account:		
Balance, January 1, 1933	$ 2,207.55	
Income 1933	10,572.92	$ 12,780.47
Expended	$ 641.22	
Transferred to Endowment Increment Fund	1,057.29	
Transferred to Special Contributions	9,150.59	10,849.10
Balance, December 31, 1933		$ 1,931.37

13. *Citizens Endowment Fund* ($253,929.26) *Restricted:*

Income Account:		
Income 1933		$ 10,739.08
Transferred to Endowment Increment Fund	$ 1,073.91	
Transferred to Special Contributions	9,665.17	10,739.08
		$ 0.00

14. *Sustaining Membership. Restricted:*

Balance, January 1, 1933	$ 66.64	
Received from dues	416.50	$ 483.14
Transferred to Annual Membership Account		458.15
Balance, December 31, 1933		$ 24.99

15. *Annual Membership. Restricted:*

Balance, January 1, 1933	$ 501.30	
Received from dues 1933	5,350.00	
Transferred from Life Membership Account	264.10	
Transferred from Sustaining Membership	458.15	
Miscellaneous Receipts	38.65	$ 6,612.20
Expended	$ 4,901.89	
Transferred to Special Contributions	1,500.00	6,401.89
Balance, December 31, 1933		$ 210.31

16. *Tuition and Sales. Restricted:*

Balance, January 1, 1933	$ 3,256.76	
Received 1933		
a. Tuitions	1,551.15	
b. Seed Packets	6,364.98	
c. Sales	324.67	
d. Miscellaneous	8.51	
Transferred from J. D. Rockefeller, Jr., Fd.	200.00	$ 11,706.07

Expended	$ 3,956.91	
Transferred to Special Contributions	5,900.00	
Transferred to Mrs. H. C. Folger Fund	.07	9,856.98
Balance, December 31, 1933		$ 1,849.09

17. *Botanic Garden Collections Fund. Restricted:*

Balance, January 1, 1933	$ 1,267.70	
Received from Contributions	6,134.00	
Miscellaneous	17.36	
Transferred from Spec. Purposes—George Washington Memorial Tree	15.00	$ 7,434.06
Expended	$ 3,145.05	
Transferred to Special Contributions	4,000.00	7,145.05
Balance, December 31, 1933		$ 289.01

18. *Cary Library Fund* $10,000.00—1/5 *of Income to Brooklyn Botanic Garden) Restricted:*

Balance, January 1, 1933	$ 28.19	
Income Allotment 1933	88.75	$ 116.94
Expended	$ 44.36	
Transferred to Endowment Increment Fund	8.88	53.24
Balance, December 31, 1933		$ 63.70

19. *Henry W. Healy Trust Fund* ($231,977.17—*1/4 of Income to Brooklyn Botanic Garden) Restricted:*

Balance, January 1, 1933	$ 0.00	
Income 1933	1,717.05	$ 1,717.05
Transferred to Endowment Increment Fund	$ 171.71	
Transferred to Special Contributions	1,545.34	1,717.05
		$ 0.00

20. *Mrs. Henry C. Folger Fund* ($1,000.00) *Restricted:*

Income Account:		
Balance, January 1, 1933	$ 19.56	
Income 1933	44.37	
Transferred from Tuition & Sales, Elem. Instr.	.07	$ 64.00
Expended		64.00
		$ 0.00

21. *Special Purposes. Restricted by Terms of Gifts:*

Balance, January 1, 1933		$ 821.83
Received:		
a. Anonymous for Japanese Garden	500.00	
b. Special Gifts for Children's Work	92.00	
c. Bronze Tablets for Glacial Boulders	61.67	
d. Victory Maples	150.00	
e. Alfred W. Jenkins Bequest	5,000.00	
f. Planting the Laboratory Plaza	1,502.00	
g. Emergency Fund	65.00	
h. Miscellaneous	534.00	$ 8,726.50
Expended	$ 5,620.96	
Transferred to Collections Fund	15.00	
Transferred to Special Contributions	2,049.60	7,685.56
Balance, December 31, 1933		$ 1,040.94

22. *Plant Pathology Research Fund. Restricted:*

Balance, January 1, 1933	$ 3.28	
Income 1933	6,000.00	$ 6,003.28
Expended	$ 28.30	
Transferred to Special Contributions	5,500.00	5,528.30
Balance, December 31, 1933		$ 474.98

23. *Special Contributions (for 1933 only) Restricted:*

Balance, January 1, 1933	$ 2,149.40	
Contributed by Staff to Emergency Unemployment Relief Fund	19.18	
Salary Rebate	200.00	
Miscellaneous	120.00	
Transferred from		
Endowment Fund Income Account	2,016.85	
Alfred T. White Fund Income Account	7,110.76	
A. Augustus Healy Bequest Income Account	391.30	
R. B. Woodward Bequest Income Account	998.43	
A. T. White Memorial Tablet Fund Income Account	155.34	
Brooklyn Inst. Centennial Fund Income Account	1,198.13	
J. D. Rockefeller, Jr., Fund Income Account	9,150.59	
Citizens Endowment Fund Income Account	9,665.17	
Annual Membership Account	1,500.00	
Tuition & Sales, Elem. Instr.	5,900.00	

Collections Fund		4,000.00
Henry W. Healy Trust Fund		1,545.34
Plant Pathology Research Fund		5,500.00
Special Purposes		
Planting Laboratory Plaza ...	$ 1,484.60	
Emergency Fund	65.00	
Miscellaneous	500.00	2,049.60
Received from Woman's Auxiliary	733.50	$ 54,403.59
Expended		52,855.03
Balance, December 31, 1933		$ 1,548.56

24. *Endowment Increment Fund* ($124,989.26) *Restricted:*

Transferred from Other Accounts 1933	$ 4,065.88	
Interest 1933	5,166.62	
E. Addie Austin Bequest	1,000.00	$ 10,232.50
Transferred to Principal		10,232.50
		$ 0.00

Summary of Private Funds Accounts:

Balances, January 1, 1933	$ 10,878.39	
Income 1933	82,065.13	$ 92,943.52
Expended	$ 72,477.03	
Transferred to Endowment Increment Fund Principal	10,232.50	82,709.53
Balances, December 31, 1933		$ 10,233.99

III. Summary of Total Maintenance Budget for 1933

Income

Tax Budget Appropriation, 47.2%	$ 82,979.44	
Private Funds Budget, 52.8%	92,943.52	
Total		$175,922.96
Transferred to Endowment Increment Fund Principal ..		10,232.50
Available		$165,690.46

Expended

Personal Service		
Tax Budget	$69,266.00	
Private Funds	52,855.03	
Total		$122,121.03

Other than Personal Service			
Tax Budget	$13,713.44		
Private Funds	19,622.00		
Total		33,335.44	$155,456.47
Balance, December 31, 1933			$ 10,233.99

Respectfully submitted,

DANIEL C. DOWNS,
Secretary and Accountant.

Note: The above "Financial Statement" is a transcript of Brooklyn Botanic Garden accounts in the books of the Treasurer of the Brooklyn Institute of Arts & Sciences. The Treasurer's accounts are audited annually by a Public Accountant, and a separate audit of this "Financial Statement" is not made in order to save unnecessary expense.

EDWIN P. MAYNARD,
Treasurer.

IV. TAX NOTES FOR PERMANENT IMPROVEMENTS

N.D.P. 212Q—Completion of improvement of Plaza of Brooklyn Botanic Garden, including construction of underground storage room for tools and bulbs. (Including Architects' Fees.)

Appropriation					$ 21,000.00
Expended					
	1930	*1931*	*1932*	*1933*	
Architects' Fees	$ 1,160.79	$ 304.33	$ 0.00	$0.00	
Improvement Work	15,477.20	3,400.00	655.00	0.00	
Totals	$16,637.99	$3,704.33	$655.00	$0.00	20,997.32
Balance, December 31, 1933					$ 2.68

N.D.P. 212T—General Improvement of Land, lying east of Mt. Prospect Reservoir fronting on Eastern Parkway, including Architects' Fees.

Appropriation			$ 24,100.00
	1932	*1933*	
Expended	$ 551.97	$0.00	
Rescinded April 1, 1932	22,368.65	0.00	22,920.62

Balance	$ 1,179.38
Contract Reserve	1,172.60
Balance, December 31, 1933	$ 6.78

Certified as correct,

EDWARD S. RYAN, *Chief Clerk,*

Department of Parks, Borough of Brooklyn.

APPENDIX 1

GIFTS RECEIVED DURING 1933

Collections Fund

Anonymous
Frank L. Babbott
Mrs. Frank L. Babbott, Jr.
Frank Bailey
Edward C. Blum
Mrs. Edward C. Blum
Brooklyn Woman's Club
Mrs. Armin E. Brunn
Mrs. Glentworth R. Butler
Mrs. S. Parkes Cadman
Walter H. Crittenden
Mrs. Mary Childs Draper
Dugan Brothers
Miss Adele F. Emerson
John W. Frothingham
Anthony Gilas
William T. Hunter
Miss C. Julie M. Husson
Miss Hilda Loines
Mrs. William W. Marshall
Mrs. Edwin P. Maynard
James H. Post
Mrs. James H. Post
Mrs. Frederic B. Pratt
Harold I. Pratt
Mrs. William A. Putnam
Miss Elise W. Stutzer
Nathan Sweedler
Mrs. Mary Van Norden
A. C. Veatch
"C. W."
Mrs. R. C. Weithas
Miss Frances E. White
Miss Harriet H. White
Peter Piper Wright (A dog)
Miss Abigail Young

Japanese Garden

Anonymous	$ 500.00

Special Gifts for Children's Work

Anonymous	$ 25.00
Mrs. Charles E. Perkins	25.00
Maxwell Teachers Training School	20.00
N. Y. P. S. Kindergarten Association, Brooklyn Section	10.00
Parent Teachers of P. S. No. 117	10.00
Miss Florence King	2.00

Bronze Tablet for Boulder Hill

Boys and Girls Club, B. B. G.	$ 61.67

Victory Maples

Colonial Daughters of the 17th Century	$ 50.00
Mrs. Walter V. Cranford	50.00
Fort Greene Chapter D. A. R.	50.00

Alfred W. Jenkins

Bequest	$5,000.00

Planting the Laboratory Plaza

Woman's Auxiliary, B. B. G. (58 Contributors)	$1,502.00

Emergency Fund

For Labor (5 Contributions)	$ 65.00

Miscellaneous

Anonymous (For labor)	$ 500.00
Women of '76 Chapter N. S. D. A. R. (Tree)	15.00
Miss Hilda Loines (Book)	10.00
Mrs. Frederick W. Rowe (Bronze Tablet)	6.00
Woman's Auxiliary of the B. B. G. (Service)	3.00

Library

Books

Anonymous	2
Antibes. Ministère de l'Agriculture. Institut des recherches agronomiques. Villa Thuret, Antibes, France	1
Becker, Mr. Herman, Brooklyn, N. Y.	1
Black, Hon. Loring M., Washington, D. C.	1
Blatt, Miss Natalie, Brooklyn, N. Y.	1
Blum, Mr. Edward C., Brooklyn, N. Y.	1
Brewster, Miss Laura M., Brooklyn, N. Y.	1
Brooklyn Botanic Garden Boys' and Girls' Club	1
Brooklyn Botanic Garden Woman's Auxiliary	2
Brooklyn College	1
Brunswick, Master Sanford, Cedarhurst, L. I.	1
Burgess, Mrs. Edward S. and Miss Burgess, Yonkers, N. Y.	1
Butler, Mrs. Glentworth R., Brooklyn, N. Y.	1
Carnegie Institution of Washington, Washington, D. C.	8
Cary, Mrs. William H., New Canaan, Conn.	1

Chichester, Mrs. Emilie P., Brooklyn, N. Y.	1
Delafield, Mrs. John R., New York, N. Y.	3
Dijon. Faculté des Sciences, Laboratoire de Botanique, Dijon, France	2
Dorward, Miss Margaret M., Brooklyn, N. Y.	1
Dr. Drushel's Class in Teaching of Elementary Science, New York University, 1933	2
Fairbanks, Miss M. B., Brooklyn, N. Y.	1
Free, Mr. Montague, Brooklyn, N. Y.	1
Gager, Dr. C. Stuart, Brooklyn, N. Y.	14
Gager, Miss Prudence, Brooklyn, N. Y.	1
General Lord Stirling Society, Children of the American Revolution, Brooklyn, N. Y.	3
Gluckson, Master Herbert, Brooklyn, N. Y.	1
Gluckson, Master Simeon, Brooklyn, N. Y.	1
Graves, Dr. Arthur Harmount, Brooklyn, N. Y.	1
Graves, Dr. Arthur Harmount and Miss Hester M. Rusk, Brooklyn, N. Y.	2
Estate of Dr. Arthur Hollick, New York, N. Y.	56
Husson, Miss C. Julie M., Brooklyn, N. Y.	3
Ikeno, Professor S., Tokyo, Japan	1
Johnson, Mr. Edward, Brooklyn, N. Y.	1
Kindergarten Mothers, P. S. 225, Brooklyn, N. Y.	1
Loines, Miss Hilda, Brooklyn, N. Y.	4
Meguro, Tokyo. Imperial Forestry Experimental Station	1
Morrison, Mr. B. Y., Washington, D. C.	1
Mothers' Club of P. S. 47, Brooklyn, N. Y.	1
National Federation of Coffee Growers of Colombia, New York, N. Y.	1
Nebraska State Horticultural Society, Lincoln, Neb.	1
Oppenheim, Mrs. William W., East Orange, N. J.	1
Parents' Association, P. S. 217, Brooklyn, N. Y.	1
Reed, Miss Mae, Brooklyn, N. Y.	1
Roosevelt Garden Club, Maxwell Teachers Training College, Brooklyn	10
Salisbury, Dr. E. J., London, Eng.	1
Shaw, Miss Ellen Eddy, Brooklyn, N. Y.	1
Smalley, Master Melvin, Brooklyn, N. Y.	2
Späth, Mr. L., Berlin, Germany	1
Stoll, Mr. Frank, Brooklyn, N. Y.	1
Taffae, Master David, Cedarhurst, L. I.	1
Taffae, Miss Rosalind, Cedarhurst, L. I.	1
U. S. Department of Agriculture, Forest Service, Washington, D. C.	2
Voris, Miss Maude E., Brooklyn, N. Y.	1
Weaver, Miss Josephine M., Brooklyn, N. Y.	1
White, Mr. Alain, Litchfield, Conn.	1
Zimmele, Mr. Charles F., Brooklyn, N. Y.	1
Total	156

PAMPHLETS

American Museum of Natural History Library, New York, N. Y. 14
Antibes. Ministère de l'Agriculture. Institut des recherches agronomiques. Villa Thuret, Antibes, France 1
Bach, Mr. Richard F., New York, N. Y. 1
Bartlett, Professor H. H., Ann Arbor, Mich. 1
Bartlett Tree Research Laboratories, Stamford, Conn. 1
Brooks, Dr. Matilda Moldenhauer, Berkeley, Calif. 12
Bryant, Mrs. E. A., Rancho Santa Ana, Los Angeles, Calif. 1
Butler, Mrs. Glentworth R., Brooklyn, N. Y. 1
Carnegie Institution of Washington, Dept. of Genetics, Cold Spring Harbor, L. I. 23
Cheney, Dr. Ralph H., Brooklyn, N. Y. 2
Coker, Dr. William C., Chapel Hill, N. C. 1
Connecticut Agricultural Experiment Station, New Haven, Conn. 1
Cornell University, Dept. of Plant Pathology, Ithaca, N. Y. 12
Dijon. Faculté des Sciences, Laboratoire de Botanique, Dijon, France 10
Firestone Tire & Rubber Company, Akron, O. 1
Free, Mr. Montague, Brooklyn, N. Y. 2
Gager, Dr. C. Stuart, Brooklyn, N. Y. 139
Gager, Mrs. C. Stuart, Brooklyn, N. Y. 1
Geologiska Foreningens, Stockholm, Sweden 3
Graves, Dr. Arthur Harmount, Brooklyn, N. Y. 23
Gundersen, Dr. Alfred, Brooklyn, N. Y. 6
Institute of International Education, New York, N. Y. 1
Kansas State Board of Agriculture, Manhattan, Kan. 1
Kurz, Dr. Herman, Tallahassee, Fla. 1
Lloyd, Professor Francis E., Montreal, P. Q. 1
Loines, Miss Hilda, Brooklyn, N. Y. 4
Lutz, Dr. Frank E., New York, N. Y. 5
Mexia, Mrs. Ynes, Berkeley, Calif. 1
Morse, Miss E. E., Berkeley, Calif. 1
Morton, Mr. C. V., Washington, D. C. 1
Mulford, Miss Fanny A., Garden City, L. I. 2
Nábělek, Dr. V., Bratislava, Czechoslovakia 2
National Federation of Coffee Growers of Colombia, New York, N. Y. 1
New York Public Library 7
New York State Conservation Department, State Council of Parks, Albany, N. Y. 1
Overbeek, Mr. J. van, Schiedam, Netherlands 1
Papadakis, Dr. J., Salonica Plant Breeding Station, Greece 1
Philippines, University of the. Plant Pathology Library, Laguna, P. I. 1
Plotnikowa, Dr. T. W., Kiew, U. S. S. R. 1
Porsild, Dr. Morten P., Disko, Greenland 1
Reed, Dr. George M., Brooklyn, N. Y. 5

Rothamsted Experimental Station, Harpenden, Herts, Eng. 6
St. John, Dr. Harold, Honolulu, Hawaii 3
Saunders, Miss Edith R., Cambridge, Eng. 1
Schmidt, Mr. G., Leonia, N. J. 1
Sears, Dr. Paul B., Norman, Okla. 1
South Carolina Food Research Commission, Charleston, S. C. 1
Spaulding, Dr. Perley, New Haven, Conn. 1
Spingarn, Mr. J. E., Amenia, N. Y. 1
Station Centrale de Pathologie Végétale, Versailles, France 4
Svenson, Dr. Henry K., Brooklyn, N. Y. 11
Szymkiewicz, Dr. Dezydery, Lwow, Poland 1
Weston, Dr. William H., Jr., Cambridge, Mass. 1

Total 327

Parts of Publications

(*Exclusive of Government Documents*)

Agassiz Association, Inc., Old Greenwich, Conn. 1
American Horticultural Society, Washington, D. C. 4
American Museum of Natural History, Dept. of Public Education, New York, N. Y. 1
Ames, Professor Oakes, Cambridge, Mass. 6
Bailey, Professor L. H., Ithaca, N. Y. 2
Bausch & Lomb Optical Company, Rochester, N. Y. 1
British Guiana. Department of Agriculture, Georgetown 1
Brooklyn Museum Library 4
Cambridge University, Cambridge, Eng. 2
Canada. Dept. of the Interior, Forest Products Laboratories, Ottawa, Ont. 4
Canada. Dept. of Mines, Geological Survey, Ottawa, Ont. 1
Carnegie Institution of Washington, Washington, D. C. 1
Carnegie Institution of Washington, Dept. of Genetics, Cold Spring Harbor, L. I. 1
Cheesman, Professor E. E., Trinidad, B. W. I. 1
Cox, Rev. George, Mornington, Victoria, Australia 3
Cromwell Publishing Company, Springfield, O. 1
Florida Entomological Society, Gainesville, Fla. 3
Flushing Garden Club, Flushing, L. I. 1
Free, Mr. Montague, Brooklyn, N. Y. 13
Gager, Dr. C. Stuart, Brooklyn, N. Y. 44
Graves, Dr. Arthur Harmount, Brooklyn, N. Y. 40
Hawaiian Academy of Sciences, Honolulu, Hawaii 2
Hawaiian Forester and Agriculturist, Honolulu, Hawaii 2
Estate of Dr. Arthur Hollick, New York, N. Y. 5
Imperial Bureau of Plant Genetics, Aberystwyth, Wales 2

Imperial College of Tropical Agriculture, Trinidad, B. W. I.	1
Jenkins, Mr. Charles F., Germantown, Pa.	4
Jenkins, Miss Dorothy, Brooklyn, N. Y.	1
Kenya Colony and Protectorate. Forest Department, Nairobi	1
Liège, Belgium. Institut de Botanique de l'Université de Liège	1
McFarland Organizations, Harrisburg, Pa.	2
Mathewson, Mr. Chester A., Flushing, N. Y.	2
Medical Society of the County of Kings, Brooklyn, N. Y.	14
Meguro Forestry Experimental Station, Meguro, Tokyo, Japan	1
Merrill, Mrs. Whitney, Brooklyn, N. Y.	1
Metropolitan Museum of Art, New York, N. Y.	6
Mulford, Miss Fanny A., Garden City, L. I.	7
National Plant, Flower and Fruit Guild, New York, N. Y.	3
National Research Council, Washington, D. C.	1
National Research Council of Japan, Tokyo, Japan	1
National Shade Tree Conference, Rochester, N. Y.	1
New York Public Library	3
New York State Museum, Albany, N. Y.	1
Ohara Institute for Agricultural Research, Kurashiki, Japan	3
Phytogeographical Society, Kyoto, Japan	1
Porto Rico, Insular Experiment Station, Rio Piedras	2
Reed, Dr. George M., Brooklyn, N. Y.	48
Roosevelt Wild Life Forest Experiment Station, Syracuse, N. Y.	1
Rothamsted Experimental Station, Harpenden, Herts, Eng.	1
School Garden Association, New York, N. Y.	5
Shaw, Miss Ellen Eddy, Brooklyn, N. Y.	5
Sociedad Española de Historia Natural, Madrid, Spain	6
Southern Methodist University, Dallas, Texas	2
Struckmann, Mr. Erick, Copenhagen, Denmark	1
Svenson, Dr. Henry K., Brooklyn, N. Y.	2
Taihoku Imperial University, Formosa, Japan	1
Tashkent, Russia. Hortus Botanicus	1
Tohoku Imperial University, Sendai, Japan	3
Towson Nurseries, Towson, Md.	6
U. S. Department of Agriculture Library, Washington, D. C.	1
U. S. Department of the Interior, National Park Service, Berkeley, Calif.	1
Wild Flower Preservation Society, Washington, D. C.	5
Worcester Natural History Society, Worcester, Mass.	2
Yale University, School of Forestry, New Haven, Conn.	4
Total	298

Portraits and Photographs

Bausch & Lomb Optical Company, Rochester, N. Y.	1
Gager, Dr. C. Stuart, Brooklyn, N. Y.	9
Harrison, Dr. Carrie, Washington, D. C.	13
Kimball, Mr. Fiske, Philadelphia, Pa.	1
Lewis, Mrs. R. B., Germantown, Pa.	8
Washington Evening Star, Washington, D. C.	1
Weston, Dr. William H., Jr., Cambridge, Mass.	4
Total	37

Autograph Letters

Gager, Dr. C. Stuart, Brooklyn, N. Y. 119

Miscellaneous

Averill, Miss Mary, New York, N. Y. 8 Post Cards.
LaRue, Miss Lena, New York, N. Y. 3 Designs based on plant forms.
Gager, Dr. C. Stuart, Brooklyn, N. Y. Mss. of paper, Effect of radium rays on plants: resumé of . . . papers from 1901 to 1932.
U. S. Dept. of the Interior, Washington. 1 Map.

Living Plants

Dr. A. A. Barnhardt, Brooklyn, 18 Desert cacti and 2 Mesembryanthemums.
Bobbink & Atkins, Rutherford, N. J., 78 rose plants in 39 varieties, 1 *Ligustrum coriaceum.*
Mrs. Otilia A. Brockway, Brooklyn, 1 plant of *Epimedium.*
Miss A. C. Clark, Brooklyn, 1 *Agave americana.*
Conard-Pyle Co., West Grove, Pa., 10 rose plants in 7 varieties.
Miss Margaret Cranford, Conn., 1 *Cleome serrulata,* 15 bulbs of *Erythronium Hendersoni,* and 4 native plants.
Mr. Harold Dinzey, Brooklyn, 20 tubers of *Sagittaria chinensis.*
Mrs. David Donalds, Elmhurst, L. I., 1 *Datura suaveolens.*
H. A. Dreer, Philadelphia, 5 plants of roses in 3 varieties.
Mr. Max Elwert, Red Hook, N. Y., 1 *Daphne Mezereum,* 6 *Asplenium.*
Gardens of the Blue Ridge, Ashford, N. C., 1 *Tsuga caroliniana.*
Greenwich Horticultural Co., New York City, 1 *Euphorbia Obesiae* and 1 *Aloe variegata.*
J. J. Grullemans & Sons, Lisse, Holland, 600 bulbs of Ideal Darwin Tulips in 30 varieties.
Miss Sadie Hecht, New York City, 1 *Agave falcata.*
Mrs. John Norman Henry, Pa., 1 *Opuntia fragilis.*
Miss Julia Holloman, Brooklyn, 2 Peanut plants, 1 *Mamillaria.*
Mrs. Henry T. Hotchkiss, Brooklyn, 6 *Calopogon pulchellus.*
Mrs. Nathan S. Jonas, L. I., 407 orchids, 96 greenhouse and hardy plants.

Mr. William Keller, Brooklyn, 1 *Crinum Rattrayii.*
Miss Katherine C. King, Brooklyn, 1 *Jasminum officinale.*
Mrs. Arthur Knapp, L. I., 1 *Hydrangea macrophylla cyanea.*
Kovac's Nursery, Purchase, N. Y., 5 rose plants in 5 varieties.
Mr. P. H. Langdon, Brooklyn, 1 hard shelled almond.
Mrs. Julia A. Latimer, Mamaroneck, 1 *Helleborus niger.*
Mr. Robert Lemmon, New York City, 3 *Epigaea repens.*
Miss McCammon, Brooklyn, 2 *Gentiana crinita.*
Joseph Manda Co., West Orange, N. J., 13 hybrid Cymbidiums.
Mrs. Whitney Merrill, Brooklyn, 1 *Helleborus niger.*
New Brunswick Nurseries, New Brunswick, N. J., 14 roses in 7 varieties.
Mrs. George Penton, Brooklyn, 2 *Lagerstroemia indica.*
Mrs. Spencer Phenix, Brooklyn, 11 native plants.
Pinehurst Nursery, Summerville, S. C., 50 Wisteria scions.
Poughkeepsie Nursery Co., Poughkeepsie, N. Y., 6 *Lonicera japonica aureo reticulata.*
Mr. Fred C. Rodman, Brooklyn, 12 bulbs of *Colchicum.*
Mr. A. Schlevogt, Kingsboro Nursery, 1713 East 16th St., Brooklyn, 1 *Salix gracilistyla.*
Mrs. C. Sellick, Brooklyn, 1 avocado and 1 cactus.
Mrs. Awbrey N. Shaw, Vt., 1 plant of *Azalea.*
Miss Elise Stutzer, Brooklyn, 1 bulb of *Boussingaultia baselloides.*
Mr. C. J. Svenson, Malden, Mass., 15 *Aronia atropurpurea.*
Mr. William Tricker, Saddle River, N. J., 39 plants in 36 varieties of water lilies.
U. S. Dept. of Agriculture, Bureau of Plant Quarantine, 9 plants and 14 cuttings of succulents.
Miss Elsie Volmer, Brooklyn, 8 *Calla palustris.*
Miss Elizabeth C. White, Whitesbog, N. J., 3 *Clethra alnifolia* (pink form), 6 *Pyxidanthera barbulata.*
Mrs. T. B. Wood, Brooklyn, N. Y., 3 *Chelone glabra*, 1 *Epigaea repens*, 2 *Marrubium vulgare.*
Miss Katherine V. Young, Bedford Hills, N. Y., 3 cuttings of *Viburnum alnifolium.*

Seeds

Mrs. Ervanna Bowen Bissell (1)
Mr. J. Cincotta (1)
Miss Margaret Cranford (4)
Miss Sadie Hecht (1)
Mrs. Henry T. Hotchkiss (1)
Dr. Homer D. House (3)
Mrs. A. E. Hyde (6)
Mrs. Stephen Loines (1)
Miss Margaret McKenny (6)
Mr. Leslie E. Mageau (2)
Mr. Lewis A. Martin (1)
Mr. George J. Peirce (2)
Mr. O. M. Pudor (1)
Dr. Attilio Ragionieri (1)
Mrs. J. E. Spingarn (1)
Mr. J. E. Spingarn (3)
Mr. J. William Thompson (1)

Note: Gifts of *Iris* are acknowledged in the Report of the Curator of Plants, page 75.

Phanerogamic Herbarium

Dr. J. A. Drushel, 76 specimens
Mr. Max Elwert, 1 specimen.
Mrs. Mary Holtzoff, 105 specimens.
Mr. B. A. Krukoff, 54 specimens.
Mrs. Stephen Loines, 1 specimen.
Miss Fanny A. Mulford, 232 specimens.
Dr. Henry K. Svenson, 88 specimens.
Mr. M. Tatewaki, 2 specimens.

Cryptogamic Herbarium

No accessions in 1934

For the Department of Elementary Instruction

Anonymous, $25.00 to be used as honorarium for lecture.
Blum, Mr. Edward C., Five books for the children's clubroom library.
Brewster, Miss Laura M., One book for the children's garden house.
Brooklyn Plant, Flower and Fruit Guild, Two shrubs for the children's garden house.
Brooklyn Section, New York Public School Kindergarten Association, $10.00 for the work of the Department.
Brunswick, Master Sanford, $1.00 for the children's clubroom library.
Butler, Mrs. Glentworth R., One prize cup competed for by the girls in the outdoor garden. One book for the children's clubroom library. $5.00 for picture of children's Shakespeare Garden to be sent to Stratford-on-Avon. One guest book for the children's clubroom.
Degen, Mr. John, $5.00 for the children's clubroom library.
Delafield, Mrs. John R., $10.00 for the children's work.
Dorward, Miss Margaret M., One book for the children's clubroom library.
Gager, Dr. C. Stuart, One book for the children's clubroom library.
Gager, Miss Prudence, One book for the children's clubroom library.
Gluckson, Master Herbert, One book for the children's clubroom library.
Gluckson, Master Simeon, One book for the children's clubroom library.
Goodman, Mr. and Mrs. Joseph, One cup competed for by the boys in the outdoor garden.
Graves, Dr. Arthur H., One book for the children's clubroom library.
Henderson, Peter & Company, One mount of labels.
Jones, Miss Ruth, One dry, unmounted cotton plant.
King, Miss Florence, $2.00 for the children's work.
Loines, Miss Hilda, Four pamphlets on wild flowers for the children's clubroom library. Twenty picture postcards of plant subjects for use in children's classes.
Maley, Miss Carleen, One book for the children's clubroom library.
Maxwell Teachers' Training College, $20.00 for books for the children's garden house.

National Federation of Coffee Growers of Colombia, Fifty booklets, "The Land of Coffee" for use in children's classes.

New York University, Class in the Teaching of Elementary Science. Two books for the children's clubroom library.

Perkins, Mrs. Charles E., $25.00 for prizes for children's garden work in the summer of 1933.

Public School 66, Woodwork Class, Nineteen implements for use in children's garden house.

Public School 117 Queens, Parent-Teachers Association, $10.00 for the children's work.

Public School 225 Mothers' Club, One book for the children's garden house.

Shaw, Miss Ellen Eddy, Five hundred reprints of article published in "School Life" January, 1933. One book for the children's garden house. Two gold honor pins for honorable service in the outdoor garden. One prize book for children's garden work. One pewter cup as award for children's work.

Singer Sewing Machine Company, Twelve sets of bird pictures for use in children's classes.

Smalley, Master Melvin, Two books for the children's clubroom library.

Taffae, Miss Rosalind, $1.00 for children's clubroom library.

Venezia, Master Louis, Two bags of tobacco dust for fertilizer.

Voris, Miss Maude E., One book for the children's garden house.

Miscellaneous

Bausch & Lomb Optical Co., Rochester, N. Y., 6 historical pictures showing development of microscope.

Mr. F. E. Kenny (Mt. Vernon Argus), Mt. Vernon, N. Y., 1 photograph of large glacial boulder on Split Rock Road connecting the Boston Post Road and Southern Boulevard, near the Mt. Vernon boundary line.

Mrs. Whitney Merrill, Brooklyn, 1 Wardian case.

Metropolitan Museum of Art, New York City, 12 photographs 8" x 10".

North Carolina, University of, 1 photograph of corn capitals.

Mrs. W. Sterling Peters, Brooklyn, 1 brass flower container.

Mrs. Spencer Phenix, Brooklyn, 1 photograph of Crocus in Brooklyn Botanic Garden lawn.

Mrs. Alfred Piza, Atlantic Beach, L. I., 1 vial of Eucalyptus medicine.

Miss Maud H. Purdy, Brooklyn, 65 flower pots.

Mr. V. L. Van Horne, Brooklyn, 30 photographs of scenes in Brooklyn Botanic Garden.

Mr. Louis Venezia, Brooklyn, 1 bushel of tobacco dust for fertilizer.

Miss Josephine Weaver, Brooklyn, 1 negative of Washington Elm at Cambridge, Mass.

APPENDIX 2

PUBLICATIONS BY THE BOTANIC GARDEN PERSONNEL DURING 1933

Becker, H.

20. Internationale Blumenschau in New York. *Gärtnerei Fachblatt* **19**: 6. June.

Frühling in New York. *Gärtnerei Fachblatt* **19**: 199. July.

Benedict, Ralph C.

Review: Oishi, Jisaburo. On the fossil Dipteridaceae. Acta Phytotaxonomica et Geobotanica. *Amer. Fern Jour.* **23**: 25. January–March.

Review: Tagawa, M. Spicilegium Pteridographiae Asiae Orientalis, I and II. Acta Phytotaxonomica et Geobotanica. *Amer. Fern Jour.* **23**: 25. January–March.

Review: Tatewaki, M. and U. Kimoto. Florula of the island of Kaibato (Todomoshiri). Acta Phytotaxonomica et Geobotanica. *Amer. Fern Jour.* **23**: 25. January–March.

Review: Andersson-Kotto, Irma. Observations on the inheritance of apospory and alternation of generations. Svensk Botanisk Tidskrift. 1932. Bd. 26, H. 1–2. *Amer. Fern Jour.* **23**: 26. January–March.

The cultural value of biology in secondary education. *New York State Education* **20**: 530. April.

Report of the Resident Investigator (Ferns) for 1932. *Brooklyn Bot. Gard. Record* **22**: 108–109. April.

The Hart's Tongue in three continents. *Amer. Fern Jour.* **23**: 63. April–June.

What is a fern? *Native Ferns.* (A Century of Progress pamphlet.) May.

A poison ivy experiment. *Torreya* **33**: 65. May–June.

Caparn, Harold A.

Park damage. *Parks and Recreation* **16**: 314. March; 376. April; 411. May.

Park policing. *Parks and Recreation* **16**: 450. June; 492. July–August; **17**: 9. September.

Cheney, Ralph H.

Coffee species and genetics. *Proceedings Sixth International Congress of Genetics* **2**: 385–386. August, 1932 (not reported last year).

Descriptive notes for *Coffea* Linn. exhibit (a detailed report of the Coffee Exhibit at Cornell University in August, 1932). Pages 1–8. Published for distribution in May, 1933.

Phosphate-buffered injection medium disturbance in caffeine effects on voluntary muscle response. *Jour. Pharm. and Exp. Therap.* **48**: 470–477. August.

Free, Montague

A vertical garden. *Better Homes and Gardens.* April.

Report of the Horticulturist and Head Gardener for 1932. *Brooklyn Bot. Gard. Record* **22**: 102–107. April.

The Brooklyn Botanic Garden exhibit of methods of plant propagation, International Flower Show, March 20–25, 1933. *Brooklyn Bot. Gard. Leaflets* **XXI**[1]. April 5.

Methods of plant propagation. *Brooklyn Bot. Gard. Leaflets* **XXI**[2–6]. April 26.

Pruning roses in spring. *American Rose Annual* **18**: 41–46. 1933.

Pruning roses in spring. *Gardener's Chronicle of America* **37**: 139. May. (Reprinted from *American Rose Annual.*)

Gager, C. Stuart

Annual report of the Brooklyn Botanic Garden: Report of the Director. *Brooklyn Bot. Gard. Record* **22**: 17–52. April.

Plant forms in design. *Bull. Metropolitan Museum of Art* **28**: 126–127. July. Reprinted in *Brooklyn Bot. Gard. Record* **22**: 172–177. July.

Notes on an American Order of Architecture. *Brooklyn Bot. Gard. Record* **22**: 177–180. July.

Graves, Arthur Harmount

Forest pathology. Work on Japanese-American hybrids during 1932. *Brooklyn Bot. Gard. Record* **22**: 57–63. April.

Report of the Curator of Public Instruction for 1932. *Brooklyn Bot. Gard. Record* **22**: 67–73. April.

29 newspaper articles relating to the Brooklyn Botanic Garden. 4 abstracts in *Biological Abstracts*.

Graves, Arthur Harmount and Hester M. Rusk

A teaching guide to the trees and shrubs of Greater New York. ix + 76 pp., 2 fig. and map. Published by the authors. February.

Reed, George M.

Plant Pathology. *Brooklyn Bot. Gard. Record* **22**: 53–57. April.

Rusk, Hester M. and Arthur H. Graves

A teaching guide to the trees and shrubs of Greater New York. ix + 76 pp. 2 fig. and map. Published by the authors. February.

Gundersen, Alfred

Report of the Curator of Plants for 1932. *Brooklyn Bot. Gard. Record* **22**: 91–96. April.

Shaw, Ellen Eddy

First hand nature study at the Brooklyn Botanic Garden. *School Life* **18**: 87–88. January.

Report on the children's garden at the Brooklyn Home for Consumptives. *Fifty-first Annual Report of the Brooklyn Home for Consumptives.* p. 26–27. January.

Report of the Curator of Elementary Instruction. *Brooklyn Bot. Gard. Record* **22**: 73–82.

The following eight articles appeared in *McCall's Magazine* in the issues indicated:

The small vegetable garden. February.
The garden plan. March.
Shrubs for you and shrubs for me. April.
The child and his garden. May.
Trouble, trouble. June.
Second bloom. July.
House plants. October.
An all-year-round garden. November.

The following 38 articles appeared in the *New York Sun* on the dates indicated:

New members of the perennial family—what seeds to choose. February 11.
Annuals of 1933. February 18.
When and how to start seed. February 25.
The vegetable garden. March 4.
Window boxes—indoors and outdoors. March 11.
Tools and fertilizers. March 18.
The city backyard—what shall we do with it? March 25.
Look out for April Fool jokes in the garden. April 1.
Have you a lily pool? April 8.
Prepare for the garden. April 15.
The commuter's vegetable garden. April 22.
Your perennial garden. April 29.
The annual garden for different soil conditions. May 6.
Vines for every need. May 13.
Set out the dahlias. May 20.
A little pruning now and then. May 27.
Meet the irises! June 3.
What shall I do with my bulbs? June 10.
Sprays for garden troubles. June 17.
What about weeds? June 24.
Cutting back and looking forward. July 1.
Garden gadgets. July 8.
The vegetable garden: its upkeep. July 15.
Make out the bulb order for next year. July 22.
Our climbing roses: their care. July 29.
Stake: restake. August 5.
Perennial lilies. August 12.
Order the evergreens. August 19.
Garden upkeep. August 26.
More suggestions for the bulb order—a last call. September 2.
Preparation of land in the fall. September 9.
Separating plants. September 16.
What shall we plant in the fall? September 23.
How to carry on fall planting. September 30.

Planting and moving shrubs. October 7.
The cold frame. October 14.
Taking up the good old house plant. October 21.
Taking up summer bulbs and tubers. October 28.

Svenson, Henry K.

List of Seeds Offered in Exchange. *Brooklyn Bot. Gard. Record* **22**: 1–11. January.
Numerous reviews for *Biological Abstracts.*
Report of the Associate Curator of Plants for 1932. *Brooklyn Bot. Gard. Record* **22**: 96–101. April.

APPENDIX 3

TALKS, LECTURES, ADDRESSES, AND PAPERS GIVEN BY THE BOTANIC GARDEN PERSONNEL DURING 1933

By the Director:

January 15. *What the Botanic Garden is doing for Brooklyn and Greater New York.* Central Branch, Y. W. C. A.
February 6. *The civic importance of botanic gardens.* Smith College Alumnae of Brooklyn. At the Garden.
May 30. *The public services of Mr. Alfred T. White, with special reference to the Brooklyn Botanic Garden.* The Peace Hero Memorial Committee of the Commission on International Justice and Good Will of the Brooklyn Federation of Churches. On the occasion of laying a wreath at the Alfred T. White Memorial Tablet. At the Garden.
December 27. *Something besides lectures* (with reference to Adult Education). American Nature Study Society. Cambridge, Mass.

By the Curator of Public Instruction:

April 28. *Forestry.* Abraham Lincoln High School.
June 27. *The work of the Brooklyn Botanic Garden.* Erasmus Hall High School pupils. At the Garden.

By the Curator of Elementary Instruction:

January 31. *Graduation address.* P. S. 139.
February 2. *Graduation address.* Franklin K. Lane High School.
February 21. *The spring garden.* Garden Department of Upper Montclair Woman's Club, Glen Ridge Woman's Club, and Montclair Garden Club, at Montclair, N. J.
March 21. *The garden in spring.* Shoreham Garden Club, Shoreham, L. I.
March 24. *Plants and their work.* Great Neck High School, Great Neck, L. I.
March 28. *The work of the Brooklyn Botanic Garden.* Tompkins Avenue Congregational Church.
April 7. *The Brooklyn Botanic Garden.* Fortnightly Library Club. At the Garden.
April 25. *The flower garden.* Kosmos Club. At the Garden.
April 26. *Gardens and children.* New York Library Club. At the Garden.
April 26. *Opportunities offered by the Brooklyn Botanic Garden to the schools.* Teachers of P. S. 186. At the Garden.
April 27. *Spring.* P. S. 159.
April 28. *Arbor Day.* Three assemblies, P. S. 185.
May 2. *May in the garden.* Three Garden Clubs of Great Neck.
May 4. *Civic contributions of the Brooklyn Botanic Garden.* City Gardens Club. At the Garden.
May 5. *Address in acceptance of gift in memory of Mrs. M. J. Plough.* Brooklyn Plant, Flower and Fruit Guild. At the Garden.
May 10. *Address of welcome.* Heads of Department Association. At the Garden.
May 11. *The work of the Brooklyn Botanic Garden.* Mothers' Club, P. S. 134. At the Garden.
May 11. *Children's work at the Brooklyn Botanic Garden.* Mothers' Club, P. S. 140. At the Garden.
May 12. *Gardens for the South Shore of Long Island.* Garden Clubs of Bellport and Westhampton. At the Garden.

May 16. *The work of elementary schools at the Brooklyn Botanic Garden.* The League of Women Voters. At the Garden.

May 17. *Tea culture in the Far East.* Brooklyn Ethical Culture School and Friends. At the Garden.

May 17. *Brooklyn Botanic Garden cooperation with the elementary schools.* Officers of the Garden Club of America. At the Garden.

May 18. *What the Brooklyn Botanic Garden does for children.* Mothers' Club, P. S. 235. At the Garden.

May 24. *Raising schoolroom plants.* Brooklyn Section, Public School Kindergarten Association. At the Garden.

May 25. *Children's work at the Brooklyn Botanic Garden.* Mothers' Club, P. S. 225. At the Garden.

June 5. *Children's work at the Brooklyn Botanic Garden.* Downtown Luncheon Club. At the Garden.

June 20. *The Brooklyn Botanic Garden.* People's Institute. At the Garden.

June 27. *Graduation address.* P. S. 132.

September 20. *Gardens.* Lily of the Valley Guild, Gerrittsen Beach.

October 2. *Bulbs for classroom planting.* Teachers of Brooklyn and Queens. At the Garden.

October 4. *Children's work at the Brooklyn Botanic Garden.* Benevolent Society, Marcy Avenue Baptist Church.

October 6. *Gardens for boys and girls.* Cedarhurst School No. 5.

October 18. *The outdoor world.* Winnebago County (Illinois) Teachers' Institute, Rural Section.

October 18. *The home and school garden.* Winnebago County (Illinois) Teachers' Institute, General Section.

October 18. *Plant propagation as related to the science program.* Winnebago County (Illinois) Teachers' Institute, Junior High School Section.

October 19. *General nature study.* Winnebago County (Illinois) Teachers' Institute, Primary Section.

October 19. *Plans and devices for elementary science teaching.* Winnebago County (Illinois) Teachers' Institute, Intermediate Section.

November 8. *Thanksgiving.* Two assemblies, P. S. 155, Queens.
November 15. *Plant life: its educational value.* Brooklyn College.
November 27. *Children's work at the Brooklyn Botanic Garden.* Parent-Teacher Association, P. S. 41.
December 4. *Nature in education.* Mothers' Club, P. S. 241.
December 22. *Christmas greens.* P. S. 36.

By the Curator of Plant Pathology:

April 2. *Iris.* Garden Club of Wyoming Valley, Pittston, Pa.

By the Curator of Plants:

January 28. *Star Maps and Seasons: Seasons and Time in Nature.* At the Brooklyn Institute, Department of Astronomy.

By the Associate Curator of Plants:

February 7. *Development of the Local Flora Section.* Woman's Auxiliary of the Brooklyn Botanic Garden. At the Garden.
December 29. *Ferns of the Galapagos and Cocos Islands.* American Association for the Advancement of Science meeting, Cambridge, Mass.

By the Horticulturist:

February 4. *Beautiful gardens.* Maine Women's Club.
April 4. *Everyday garden practices.* School for Ornamental Gardeners, Dept. of Floriculture, University of Maryland.
April 5. *Rock garden construction.* School for Ornamental Gardeners, Dept. of Floriculture, University of Maryland.
June 13. *Origin of garden roses.* Rose Garden Day. At the Garden.
June 14. *Making a rock garden.* Field Day of the New Jersey State Experiment Station, New Brunswick.
June 19. *Roses.* Mt. Vernon Garden Club.
October 16. *Berry-bearing shrubs.* Nathan Hale Garden Club, Huntington.

By Instructors:

Miss Dorward:

March 17. *Window boxes.* New York Public Library Group.
June 21. *Continuous bloom in the garden.* Garden Club of Yorktown.

Miss Jenkins:

February 28. *The educational work of the Brooklyn Botanic Garden.* P. S. 115.
March 22. *Birds and their service to man.* P. S. 238.
April 4. *Gardening for children.* Mothers' Club, P. S. 167.
April 10. *Preparation for the outdoor garden.* Teachers of Brooklyn and Queens schools. At the Garden.
April 24. *What to plant in a school garden.* Teachers of Brooklyn and Queens schools. At the Garden.
April 27. *How to start a backyard garden.* Bedford Branch, Brooklyn Public Library.
April 28. *Arbor Day.* P. S. 142.
May 25. *Gardens.* P. S. 165.
July 25. *Flower arrangement.* Valley Garden Club of Spring Valley, N. Y.
September 25. *The school garden in the fall.* Teachers of Brooklyn and Queens schools. At the Garden.
November 10. *Flower arrangement.* Plandome Garden Club.
December 27. *By-products of a children's garden.* American Nature Study Society, Boston, Mass.

Miss Miner:

February 20. *Plants and their seeds.* Three assemblies, P. S. 117, Queens.
June 8. *The Brooklyn Botanic Garden.* Parents' Association, P. S. 219. At the Garden.
October 9. *The school window box and the terrarium.* Teachers of Brooklyn and Queens schools. At the Garden.

By the Resident Investigator (Economic Plants):

March 2. *The Genus Coffea Linn.* Rutgers University Biology Seminar.

December 11. *Relation of coffee and caffeine to human efficiency.* New York Branch, American Pharmaceutical Association. Brooklyn College of Pharmacy.

APPENDIX 4

RADIO TALKS BY THE BOTANIC GARDEN PERSONNEL DURING 1933

By the Horticulturist:

*From Station WOR**

January 5. Plants for the aquarium.
February 9. Repotting house plants.
March 30. Bloom the year round in the garden.
April 20. Planting trees, shrubs and evergreens.
May 18. Planting the annual garden.
June 8. Inspecting famous gardens.
August 17. Starting perennials from seed.
August 28. Planting the rock garden.
September 18. Plants for hedges.
November 6. Fall planting in the rock garden.
December 22. Christmas plant folk lore.

From Station WNYC

August 24. August in the garden.
October 19. October in the garden.
November 16. November in the garden.
December 14. Putting the garden to bed.
December 28. Winter pruning.

* Radio Garden Club addresses given in connection with Co-operative Extension Work in Agriculture and Home Economics of the State of New Jersey.

By the Curator of Public Instruction (Station WNYC):

October 12. The educational program at the Brooklyn Botanic Garden.
October 26. Some features of especial interest at the Brooklyn Botanic Garden.
November 9. What to see at the Brooklyn Botanic Garden.
November 23. Plant breeding at the Brooklyn Botanic Garden.
December 7. Can we bring back the chestnut tree?
December 21. Can we bring back the chestnut tree? (Concluded).

By the Associate Curator of Plants (Station WOR):

July 20. Growing wildflowers.

By the Curator of Elementary Instruction:

From Station WINS

April 8. Gardens for one and all.

From Station WNYC

October 5. Fall gardening at the Brooklyn Botanic Garden.
November 30. The travels of a Thanksgiving dinner.

By Instructors (Miss Jenkins). Station WNYC:

August 3. The children's garden of the Brooklyn Botanic Garden.
September 14. The Japanese Garden at the Brooklyn Botanic Garden.

APPENDIX 5

FIELD TRIPS CONDUCTED

By the Curator of Plants:

August 26–30. Torrey Botanical Club in the Catskills.

APPENDIX 6

MEETINGS OF ORGANIZATIONS AT THE GARDEN 1933

February 6. Smith College Club.
February 7. Woman's Auxiliary, Brooklyn Botanic Garden.
April 3. Woman's Auxiliary, Brooklyn Botanic Garden.
April 7. Fortnightly Club.
April 15. Writers' Club of Brooklyn.
April 18. St. Mary's Hospital Guild.
April 19. Dr. White Memorial Catholic Settlement Association.
April 20. Boy Scouts of America, Woodmere, Long Island.
April 25. Kosmos Club.
April 26. New York Library Club.
April 26. Teachers Club of P. S. 186, Brooklyn.
April 27. Contemporary Club.
April 28. Shoreham Garden Club.
May 1. Schola Club of Brooklyn.
May 3. Women of '76, N. S. D. A. R.
May 3. Christ Child Society.
May 4. City Gardens Club.
May 5. Prince Bay Woman's Club of Staten Island.
May 5. Brooklyn Plant, Flower and Fruit Guild.
May 6. Reconciliation Tours.
May 8. Caldwell (N. J.) Garden Club.
May 8. Woman's Aid Society of the Japanese M. E. Church.
May 10. Brooklyn Heads of Department Association.
May 10. Catholic Alumnae Group.
May 11. Hollis Woman's Club.
May 11. Mothers' Club, P. S. 140.
May 11. Chiropean Club.
May 11. Mothers Club, P. S. 134.
May 12. Bellport-Westhampton Garden Club.
May 13. Writers' Club of Brooklyn.
May 14. Temple Emanuel Religious Group.
May 15. Peninsula College Woman's Club.
May 16. League of Women Voters.

May 17. Officers of the Garden Club of America.
May 17. Brooklyn Ethical Culture Exhibit.
May 18. Business Girls of Central Branch Y. M. C. A., Brooklyn.
May 18. Mothers Club, P. S. 235.
May 30. Brooklyn Federation of Churches, Committee for Honoring Peace Time Heroes.
June 1. Brooklyn Girl Scouts.
June 5. Downtown Luncheon Club.
June 6. Ellen Hardin Walworth Chapter, N. S. D. A. R.
June 7. Chaminade Club.
June 8. Mothers Club, P. S. 219.
June 8. Minisink Garden Club.
June 9. Horticultural Society of New York.
June 15. Brooklyn College Faculty and Seniors.
June 21. People's Institute.
October 9. Illuminati Club.
October 10. Department of Botany, Brooklyn Institute of Arts and Sciences.

	1931	*1932*	*1933*
Number of organizations	23	59	49
Total attendance	1,146	2,741	3,357

APPENDIX 7

REPORT ON PHOTOGRAPHIC WORK

Negatives on file December 31, 1932	8,400
Negatives accessioned during 1933	144
Total negatives on file December 31, 1933	8,544
Lantern slides on file December 31, 1932	6,105
Lantern slides discarded during 1933	30
	6,075
Lantern slides accessioned during 1933	15
Total lantern slides on file December 31, 1933	6,090

Prints on file December 31, 1932		4,776
Prints made during 1933	313	
Used or distributed	169	
Prints filed during 1933		144
Total prints on file December 31, 1933		4,920
Enlargements made		9

Respectfully submitted,

FRANK STOLL,
Registrar.

APPENDIX 8

REPORT ON BROOKLYN BOTANIC GARDEN PUBLICATIONS, 1933

American Journal of Botany

Official Organ of the Botanical Society of America

Volume XX (1933) comprised, as usual, ten monthly issues (omitting August and September), with 53 papers, 696 pages, 48 plates, and 280 text figures (as against 63 papers, 865 pages, 57 plates, and 387 text figures in 1932). Dr. Arthur Harmount Graves continued on the editorial board as representative of the Brooklyn Botanic Garden. Professor Sam F. Trelease, of Columbia University, continued as Editor-in-Chief.

The circulation at the close of the fiscal year (November 30, 1933) was 1,582 as against 1,697 one year ago. The annual budget was $12,294.38 as against $14,523.64 in 1932. The year closed with a credit balance of $2,648.78 and assets over liabilities of $1,010.43 plus the value of back sets and volumes on hand.

Ecology

Official Organ of the Ecological Society of America

Quarterly. Volume XIV comprised 28 papers (besides reviews, proceedings, and miscellaneous matter), 420 pages and 138 text figures (as against 35 papers, 424 pages and 109 text figures in 1932). The circulation at the close of the fiscal year (November 30, 1933) was 943 as against 1,160 one year ago.

The annual budget was $5,046.50, the credit balance $899.70 and assets over liabilities $985.18 (against $5,286.64, $1,727.37 and $1,156.71 assets over liabilities in 1932) plus the value of back sets and volumes on hand. Dr. Henry K. Svenson continued on the editorial board as the Brooklyn Botanic Garden representative. Prof. Alfred E. Emerson and Prof. George D. Fuller, both of the University of Chicago, continued as Editor and Associate Editor, respectively.

Genetics

In Co-operation with the Editorial Board of Genetics

Bimonthly. Volume XVIII comprised 31 papers, 555 pages, 6 plates, and 91 text figures (as against 34 papers, 711 pages, 13 plates, and 97 text figures in 1932). At the close of the fiscal year (November 30, 1933) the circulation was 610, the annual budget $5,966.98, the credit balance $1,531.01, and assets over liabilities $1,630.38 (as against 657, $5,822.13, and $983.01 in 1932), plus the value of back sets and volumes on hand. Dr. Donald F. Jones, Connecticut Agricultural Experiment Station, continued as Managing Editor.

Brooklyn Botanic Garden Record

Beginning with the issue for January 1933 (Volume XXII, No. 1), the Botanic Garden Record was changed from a bimonthly to a quarterly, as it was previous to 1929. Volume XXII comprised 212 pages. The April number comprised the Annual Report. The circulation of the Record at the close of the year was 1,615.

Leaflets

One single number, 1 double number, and 1 quadruple number were issued. The circulation as of December was 1,939 copies. Dr. Arthur Harmount Graves, curator of public instruction, is the editor.

Contributions and Memoirs

None were published during 1933.

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Membership.—All persons who are interested in the objects and maintenance of the Brooklyn Botanic Garden are eligible to membership. Members enjoy special privileges. Annual Membership, $10 yearly; Sustaining Membership, $25 yearly; Life Membership, $500. Full information concerning membership may be had by addressing *The Director, Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, N. Y.* Telephone, Prospect 9-6173.

The Botanic Garden is open free to the public daily from 8 a.m. until dusk; on Sundays and Holidays it is open at 10 a.m.

Entrances.—On Flatbush Avenue, near Empire Boulevard and near Mt. Prospect Reservoir; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

The street entrance to the Laboratory Building is at 1000 Washington Avenue, opposite Crown Street.

To Assist Members and others in studying the collections the services of a docent may be obtained. This service is free of charge to *members of the Botanic Garden;* to others there is a charge of 50 cents per person. Arrangements must be made by application to the Curator of Public Instruction at least one day in advance. No parties of less than six adults will be conducted.

To Reach the Garden take Broadway (B.M.T.) Subway to Prospect Park Station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, or Tompkins Avenue trolleys to Washington Avenue; St. John's Place trolley to Sterling Place and Washington Avenue; Union Street or Vanderbilt Avenue trolleys to Prospect Park Plaza and Union Street. By Automobile from points on Long Island take Eastern Parkway west and turn left at Washington Avenue; from Manhattan, take Manhattan Bridge, follow Flatbush Avenue Extension and Flatbush Avenue to Eastern Parkway, turn left following Parkway to Washington Avenue; then turn right.

BROOKLYN BOTANIC GARDEN
PUBLICATIONS

RECORD. Established, January, 1912. An administrative periodical issued quarterly (1912–1928); bimonthly (1929–1932); quarterly (1933–). Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, guides, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others $1.00 a year. Circulates in 59 countries.

MEMOIRS. Established, July, 1918. Published irregularly. Circulates in 47 countries.

Volume I. *Dedication Papers:* comprising 33 scientific papers presented at the dedication of the laboratory building and plant houses, April 19–21, 1917. 521 pages. Price $3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. By Norman Taylor, June 11, 1923. 108 pages. Price $1.00, plus postage.

Volume III. Vegetation of Mount Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor, June 10, 1927. 151 pages. Price $1.60.

CONTRIBUTIONS. Established, April 1, 1911. Papers originally published in periodicals, reissued as "separates," without change of paging, and numbered consecutively. Twenty-five numbers constitute one volume. Price 25 cents each, $5.00 a volume. Circulates in 34 countries.

63. Inheritance of resistance to loose and covered smut in a hybrid of Early Gothland and Victor oats. 10 pages. 1932.

64. Inheritance of resistance to loose and covered smut in hybrids of Hull-less with Early Gothland and Monarch oats. 28 pages. 1932.

65. Monographic studies in the genus Eleocharis—II. 34 pages. 1932.

66. Inheritance of resistance to loose and covered smut in hybrids of Black Mesdag with Hull-less, Silvermine, and Early Champion oats. 14 pages. 1934.

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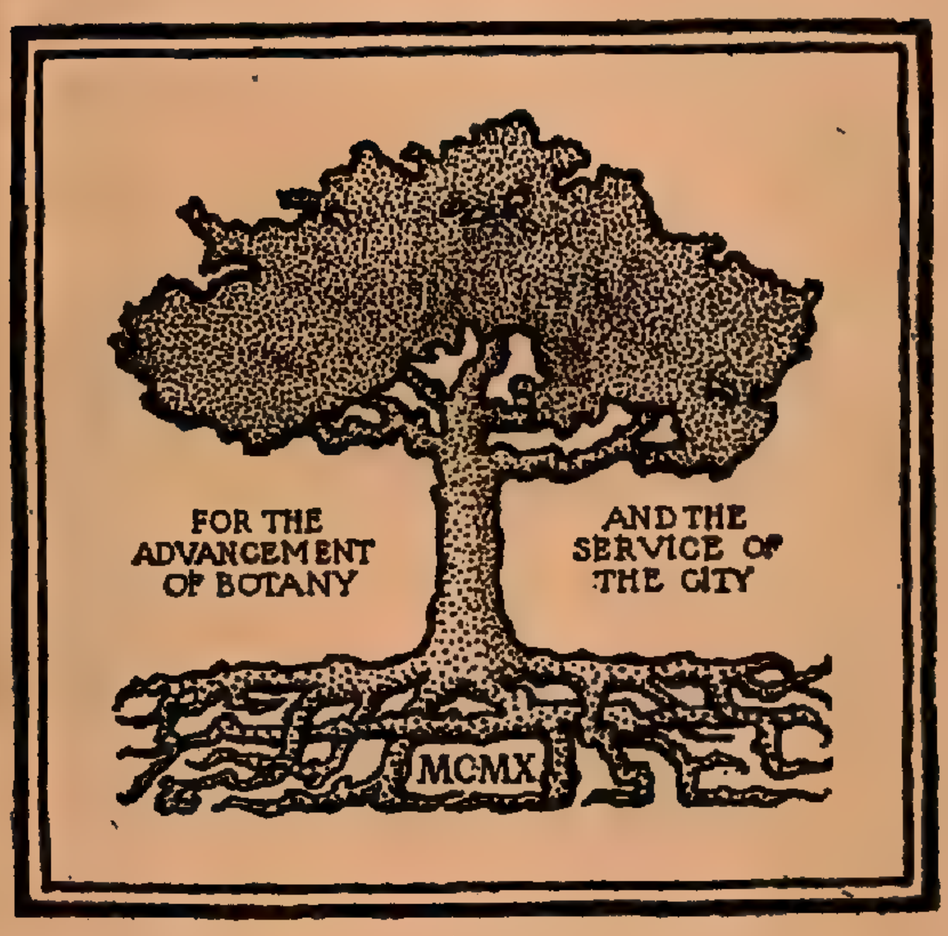

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To Miss Hester M. Reed
with the seasons greetings
Carlton D. Pearce
Sept. 24. 1934

BROOKLYN BOTANIC GARDEN RECORD

VOL. XXIII JULY, 1934 NO. 3

REPORT ON WINTER INJURY TO THE WOODY PLANTS IN THE BROOKLYN BOTANIC GARDEN, 1933–1934

Doubtless such extreme cold periods as we experienced during the past winter have occurred intermittently since the beginnings of our present climate. It is obvious that they must be largely responsible for the northern limit of the range of our more tender native species. Not only this, but as the following report will show, extreme cold periods like that of the winter of 1933–34 determine what kinds of exotics can be grown successfully in our region. During ordinary years, a given species may survive the winters and continue to flourish from year to year. But the decisive factor is the extreme low temperature periods that occur at rare intervals. Then the more tender species may be entirely killed.

Extreme Weather Conditions in the Winter of 1933–34

There were two periods of extreme cold in the winter of 1933–34. The temperatures and amount of snow on the ground from day to day are shown in the following tables kindly supplied by the New York City Station of the United States Weather Bureau.

The first period (in December, 1933) was the less severe. Very probably if it had been the only one the plants would have suffered comparatively little. There are some features in it, however, which are distinctly dangerous. First, the drop from a maximum of 54° on Christmas Day (which, by the way, was the highest temperature for the whole month) to a minimum of 12° above zero on December 27th is rather sudden. To be felt by the plant as little as possible, a change in temperature should be

TABLE SHOWING TEMPERATURE AND SNOW COVER DURING EXTREME COLD PERIODS IN WINTER OF 1933–34

Date	December, 1933					Date	February, 1934				
	Temperature (Degrees, Fahrenheit)			Snow (Inches)			Temperature (Degrees, Fahrenheit)			Snow (Inches)	
	Maximum	Minimum	Mean	Snowfall (midnight to midnight)	Depth of Snow on Ground at 8 p.m.		Maximum	Minimum	Mean	Snowfall (midnight to midnight)	Depth of Snow on Ground at 8 p.m.
M 25 . . .	54	31	42	0	0	T 1 . . .	35	30	32	9.6	6.5
T 26 . . .	35	22	28	10.0	9.7	F 2 . . .	31	11	21	0	9.0
W 27 . . .	26	12	19	0	9.3	S 3 . . .	23	4	14	0	8.4
T 28 . . .	23	8	16	0	8.8	S 4 . . .	27	15	21	0.1	7.1
F 29 . . .	15	−3	6	0	8.6	M 5 . . .	29	17	23	0	6.0
S 30 . . .	14	−6	4	T*	8.5	T 6 . . .	20	5	12	0	5.5
S 31 . . .	42	12	27	0	6.6	W 7 . . .	31	13	22	T*	5.0
						T 8 . . .	21	−7	7	0	4.8
						F 9 . . .	8	−14	−3	0	4.7
						S 10 . . .	27	−2	12	0	4.3
						S 11 . . .	33	12	22	0	3.4

* T = trace.

gradual. Many a plant has been killed by sudden freezing when it might endure without detriment much lower temperatures arrived at gradually. Another factor is, of course, the subzero temperatures (for a period of *two* days) which are fairly unusual for December in this region. How unusual they are is shown by the fact that subzero temperatures have been recorded in December only in four other years since and including 1871 (when records first began to be kept), namely in 1917, 13° below; 1880, 6° below; 1876, 2° below; and 1871, 1° below. This of course applies to the month of December only. Subzero temperatures in January and February in past years have been somewhat more frequent. January has had eleven days with subzero temperatures since and including 1871 and February eleven. (March has never had a subzero temperature since records began to be kept.) But it is probable that subzero temperatures in December are more harmful than those which come in January and February, for the

reason given above, that it is better for the plant to become gradually accustomed to the cold.

As regards the amount of snow on the ground in December, it will be seen from the table that ten inches fell on the 26th, which had melted to 6.6 inches by the 31st. The amount of snow cover during these cold spells is an important and decisive factor in the amount of winter injury sustained by low-growing plants such as the Heaths. Snow protects the parts that it covers both from extreme cold and from the drying effects of the winds. Furthermore, it protects the roots of the taller plants. Dr. Alfred Gundersen, Curator of Plants at the Garden, tells us that in his native home in Norway each spring the low-growing woody plants were often found killed down to a definite line. This was the snow line.

In the case of the Swiss Heath (*Erica carnea*), which now for twelve years has done yeoman service through all the winter, often blooming on a warm day even in January, this blanket of snow probably saved its life. For we find that although the upper parts are killed, there are many sound shoots close to the ground.

The other extreme cold period, as shown in the table, was in February, 1934. The mercury on February 9 stood at — 14° F. —the lowest that the weather bureau in New York City has ever recorded. But the figures we have reproduced for a few days in February do not tell the entire story, for the weather continued extremely cold throughout the month, with a minimum of 3° above zero on the 14th, 6° above on the 24th, 7° above on the 28th, and many other days on which the minimum was not far above these figures. The mean minimum for the whole month was 10.8° and the mean maximum 28.9°, as against a normal minimum of 24.2° and a normal maximum of 38.4°. It was an extremely cold month as a whole: on only ten days of the month did the temperature rise above the freezing point, and on only four days above 40°. As regards the snow cover, however, we were again fortunate, for during the coldest period, as shown in the table, there was a considerable blanket of snow on the ground. For a few days, namely, from the 12th to the 17th inclusive, this was reduced to from 2½ inches to half an inch on the 18th; but snowfalls on the 19th, 20th, 25th, and 26th replenished the supply, so that at

the end of the month there was more than a foot of snow on the ground.

As regards the direction and velocity of the winds, these as a rule are not noteworthy, but a northwest wind with a velocity of fifty miles per hour on the 13th (minimum temperature 8°) and a velocity of fifty-one miles per hour on the 23d (minimum temperature 10°) must have made matters much worse.

Other Disastrous Winters in the History of the Garden

In connection with the present report it is interesting to compare the reports of Taylor on the effects of the winters of 1917–18 and 1919–20 on the woody plants in the Garden. Regarding the first period he says "Since weather records have been kept, there has been no such severe winter as the one just past. During the Christmas holidays, and just after, minimum temperatures were recorded of —13° at the Weather Bureau (414 ft. in the air), —10° at the New York Botanical Garden, —7° at the Central Park Weather Bureau station, which is nearly at ground level, and —8° at the Brooklyn Botanic Garden where the thermometer is in a somewhat sheltered place. The first four days of the year showed minimum temperatures of —5°, +2°, 0°, and —3° respectively, and on January 12 the temperature was 50. Worst of all, on the latter day, the velocity of the wind was greater here than in any other place in the country, the record showing maximum velocity of 84 miles an hour, from the southeast. The following of such extreme cold by a warm wind of this great velocity apparently played havoc with many valuable plants in the Garden. With the ground frozen to depths unknown before, as there was practically no snow covering during the coldest days, the root activity of most plants would be stopped, while the warm wind on the 12th, when the maximum temperature for January was recorded, would dry out many evergreens even if they had withstood the cold of a few days before. Because of this combination of cold temperatures followed by warm wind, it is perhaps impossible to ascribe all our losses to cold alone. Certainly one or the other, or most probably their combination, has had disastrous results. . . ." [1]

[1] Taylor, Norman. Effects of the severe winter on the woody plants in the Garden. Brooklyn Bot. Gard. Record 7: 83–84. 1918.

It is apparent that perhaps the worst feature of this period was the extremely violent (84 miles per hour) warm wind following directly after the cold period. This should be borne in mind in connection with what will be said later regarding the complexity of conditions causing winter injury.

In his report on injury due to the conditions in the winter of 1919–20, Taylor says; "While the winter of two years ago had several days when the temperature was lower than ever before recorded here, the past winter was more continuously cold than any other for thirty years. The notes on the effects of the past winter are, therefore, a record not so much of what one unprecedented period of low temperature will do, but rather the cumulative effect of two exceptionally bad winters, with only a single mild one intervening—that of 1918–1919." [1]

In his first report (for the winter of 1917–18) Taylor divides the winter injuries into four categories.

I. Killed outright.
II. Killed to the ground but making new growth.
III. Severely winter-killed, but now making recovery.
IV. Only a little winter-killed.

For the sake of comparisons with the same species or varieties in our present list, we have cited Taylor's findings wherever they apply, using the following symbols and adding the figures '17–18, thus:

I = K: '17–18
II = KG: '17–18
III = SKR: '17–18
IV = LK: '17–18

In his second report (for the winter of 1919–20) Taylor divides the winter injuries into three categories, as follows:

I. Winter-killed.
II. Severely winter-killed, but recovering.
III. Slightly winter-killed.

In a similar way we have inserted these verdicts in our present report, using the following symbols:

[1] Taylor, Norman. Effects of the winter of 1919–1920 on the woody plants in the Garden. Brooklyn Bot. Gard. Record **9**: 121. 1920.

I = K: '19–20.
II = SKR: '19–20.
III = LK: '19–20.

It is hardly necessary to add that the total number of woody plants in the Garden at the time Taylor's reports were written was much smaller than it is today. Then the Garden was only seven and nine years old, respectively.

Perennial Plants

In a consideration of winter injury it is of course the perennial plants with which we are concerned, since they are the ones which have to live through the winter. Biennial plants, it is true, must also pass through one winter, but these are comparatively few in number, and include no woody species.

All perennial plants may be classified into herbaceous and woody species. The herbaceous kinds, *e.g.*, the peony, iris, and most kinds of lawn grasses, have no wood in their stems, and die down to the ground completely at the first "killing" frosts of winter, maintaining their existence throughout the winter in an underground stem or rhizome, a tuber, or a corm. These, then, are protected to a considerable extent during the winter period by a blanket of earth, and sometimes also by an additional covering of snow.

The woody perennials, on the other hand, whether they are shrubs such as the rose and the honeysuckle, or trees like the elm and the maple, drop their leaves at the approach of winter. Their woody stems, being exposed to the elements, have to resist death from cold if they are to retain the size to which they have grown. For if the part above ground is killed, they have to start all over again from basal shoots. Many of our shrubs, *e.g.*, many of the Callicarpas, the Spiketails, and the Buddleias, are having to do this now, and one might argue that no permanent injury has resulted. These plants, although woody, have simply been reduced to the somewhat anomalous position of membership in the class of herbaceous perennials. Still provided with vigorous roots, they can shoot up again with a rapid and extensive development of stem and leaves. In some regions, in fact, some of the Buddleias do

this as a regular thing, blossoming each year in midsummer. It is hardly necessary to add, however, that repeated injury like this cannot be for the best good of the plant. Further, the rank growth put forth by killed back individuals is the more sensitive to injury the succeeding winter.

Nature of Injury from Extreme Cold

Sachs long ago showed that under ordinary conditions, when plants are frozen, water passes out from the protoplasm and freezes in the intercellular spaces. When thawing occurs, the resultant water remains in the intercellular spaces until it is either evaporated or is reabsorbed by the cells which had released it, and which had become more or less plasmolyzed. In some cases it requires considerable time for the protoplasm to resume its normal condition and position and thus for the cell to regain its turgidity. Freezing in plants has been observed by Wiegand [1] to occur in the intercellular spaces. Water withdrawn from the cells forms ice crystals in these spaces. Excessive withdrawal of water from the cells of course results in considerable plasmolysis, and if this continues to an extreme point, death must ensue. It seems obvious that continued or extreme low temperatures would cause a continued removal of water from the cell, thus eventually causing the death of the cell itself.

Winter Injury the Result of a Complex of Conditions

Although we believe that the extreme low temperatures of the past winter were the fundamental cause of the injuries to our woody plants, yet it is evident, after careful observation of the different plants, that the matter is not really so simple as this.

No one can gainsay the fact that, given sufficiently low temperature, protoplasm will freeze, or at least become so altered chemically that it is no longer protoplasm, and hence no longer alive. Yet the physiological condition in which the plant finds itself at the onset of the cold period has much to do with its relative susceptibility and the extent of injury it sustains. This explains

[1] Wiegand, K. M. The passage of water from the plant cell during freezing. *Plant World* **9:** 107–118. 1906.

in part so many apparent discrepancies in hardiness in different individuals of the same species, and, furthermore, it accounts for different results in different winters. So much depends upon the amount of water present in the plant; the kind of growth it made the season before, whether vigorous or slight, early or late; whether or not it was pruned, and if so, how much, and when; whether or not it was exposed to drying winds or direct rays of the sun; whether or not it had been recently planted or moved, and so, how well it had become established in the soil—these are some of the things we may mention briefly to show how the physiological condition of individuals may vary. In addition, we should note that there is in all probability an inherent predispositional factor (residing in the protoplasm itself)—*i.e.* predisposing a given individual to injury from cold. This of course is bound up with the constitution of the protoplasm. If such predisposition exists in animals and ourselves (and there seems to be no doubt of this) it seems reasonable to assume that it occurs also in plants. The following paragraph deals with this conception from a genetic point of view.

Hereditary Nature of Hardiness

In an earlier number of this journal, Dr. Orland E. White, formerly Curator of Plant Breeding at the Garden, has stated that since hardiness in plants is an hereditary character, "its basis is dependent on the presence or absence of certain genes" or hereditary units in the nucleus of the plant cell. Since new genes (and thus new characters) may arise by mutation, it is conceivable, he says, that a given plant species may have among the individuals composing it some 'hardy' mutants. In other words, cold resistant varieties may perhaps arise within a plant species by mutation.[1]

Reasons for Discrepancies in Data on Hardiness

Because of these individual differences; and because of the complexity of the factors whose interaction determines the degree of a plant's susceptibility to winter injury, any collection

[1] White, O. E. Geographical distribution and the cold-resisting character of certain herbaceous perennial and woody plant groups. Brooklyn Bot. Gard. Record **15**: 1–10. 1926.

of data on hardiness will of necessity show discrepancies. We may summarize the more important reasons for these discrepancies as follows:

I. Possibility of variation between individuals of the same species with respect to susceptibility to cold.

II. Site. Locations in the Garden vary as regards protection from cold, soil conditions, and exposure to wind and sun.

III. Extent to which plants have become established. Specimens set out within the last year or two may be more susceptible to injury than those whose roots are well established in the soil.

IV. Some individuals may have been predisposed to injury by attacks of insects, fungi, from drought, or other external factors.

V. Other causes for the variation in the physiological condition of individuals resulting in predisposition to injury from cold. (See paragraph above on "winter injury the result of a complex of conditions.")

VI. Size of individuals. It is possible that in some cases, larger individuals which have grown in a given location for a number of years, may be more cold resistant than smaller specimens—this, too, apart from the fact that their roots are doubtless better established in the soil.

For these reasons the data presented below can not be regarded as an absolute criterion of hardiness for any given species.

Explanation of Symbols Used in List

The families with indeterminate growth, such as the roses and honeysuckles, are of course especially susceptible. Where A has been inserted after these or any other species, the meaning is that even in spite of the injury the plant looks well, the new growth having hidden the dead shoots or shoot tips. It will be noted throughout the list that many species are included which were not injured. This winter was such a rigorous test that we think it advantageous to have at least a partial list of those that passed through the ordeal successfully.

Many of the "half hardy" plants, *e.g., Magnolia grandiflora,* were protected from early December throughout the winter by a covering of burlap or lath screens. These plants are designated **P**. The symbols used to designate the data presented in Taylor's

reports have already been explained (pp. 175–176). Those plants which are in the nursery are marked **N.** Many of these are being tested there for hardiness under Brooklyn conditions.

The following Roman numerals are used to denote the character of the winter injury in 1933–34, and, in the cases of the last three, its extent.

I. Entirely dead. (Roots and stems all killed.)
II. Killed to base. (Roots apparently sound; new basal shoots showing.)
III. Percentage of main shoots killed.
IV. Percentage of branch tips killed.
V. Evergreens: percentage of leaves killed.

GYMNOSPERMAE

Ginkgoaceae

Ginkgo biloba—*Uninjured*

Gnetaceae

Ephedra
distachya—S. Eu., N. Asia—IV 50% **N**
major var. procera—*Uninjured*

Pinaceae

Abies Nordmanniana—S.W. Eu., Asia Minor—Slight browning of tips of leaves. **LK**: '17–18; **SKR**: '19–20
Araucaria araucana—Chile—I **N**
Cedrus
atlantica—N. Afr.—IV slight—three specimens. Fair sized trees about 25 ft. high
deodara—Himalayas—I **P**
Libani—Asia Minor & Syria—Two specimens: one uninjured, not **P**; other killed back about ½ way from tip of 2 main leaders. **P**; **SKR**: '17–18
Chamaecyparis
obtusa—Japan—A little injury on north side. **K**: '17–18
(nana) **SKR**: '17–18; **LK**: '17–18; **K**: '19–20

pisifera var. squarrosa—IV 50%. In rather bad condition
Uninjured: pisifera, pisifera var. aurea, pisifera var. filifera, pisifera var. plumosa

Cryptomeria japonica—China & Japan—IV slight. In good condition **SKR**: '17–18; **LK**: '17–18; **SKR**: '19–20

Cunninghamia lanceolata—S. & W. China—I **N**

Glyptostrobus pensilis—China—II **N**

Juniperus

chinensis—China & Japan—Some tips of branches browned; **SKR**: '19–20

communis—N. temp. & Arctic regions—Some of last year's leaves browned, but plant in good condition

scopulorum—Western U. S. & Can.—IV 50%. Looks sickly

Uninjured: chinensis (dwarf), chinensis var. Pfitzeriana, horizontalis, Sabina, squamata var. Meyeri; virginiana (**SKR**: '19–20)

Larix laricina and leptolepis—*Uninjured*

Picea

pungens—Colo. to N. Mex., Utah & Wyoming—V slight; **SKR**: '17–18; **LK**: '17–18; **SKR**: '19–20; **LK**: '19–20

Uninjured: omorika, orientalis; polita; **SKR**: '17–18; '19–20

Pinus

Cembra—Eu. & N. Asia—Some specimens show a little browning of old leaves at tips

densiflora—Japan—IV & V slight

excelsa—Himalayas—About 50% of old needles shed; those remaining, about 50% brown; branches uninjured; new needles healthy

koraiensis—Japan, Korea—Some specimens show a slight browning of tips of old leaves.

nigra—C. &. S. Eu., Asia Minor—Many specimens: some browning of needles in a few cases. Seems to be best pine for N. Y. City conditions of summer and winter

Pinaster—Mediterr. Region—I **N**
ponderosa var. scopulorum—W. U. S.—Old leaves somewhat browned
pungens—N. J. to Ga.—Old leaves browned about half way
Strobus—Eastern N. A.—Old leaves a little browned at tips. In good condition
tabulaeformis (sinensis)—N. to W. China—one specimen V 100%; IV 40%. Many terminal buds seem injured. It may recover. One specimen V 50%; IV 50%
Thunbergiana—Japan—one specimen has leaves browned at tips. One specimen has lost nearly all its old leaves. Buds not injured. Two other specimens in bad shape (partly bud moth injury). Many of old leaves and some of branch tips killed: one six ft., one 12 ft. high.
Uninjured: Banksiana, Bungeana, densiflora var. umbraculifera, flexilis, montana, monticola, parviflora, parviflora var glauca, ponderosa, rigida, sylvestris
Pseudolarix Kaempferi—E. China—*Uninjured*
Pseudotsuga Douglasii—B. C. & W. U. S.—*Uninjured*
Sequoia gigantea—Sierra Nevadas—One specimen I; other specimen (8 ft. high) badly killed on main stem and all branches, but many green shoots coming out from branches. **SKR**: '17–18 "nearly dead" **P**
Taxodium distichum—*Uninjured*
Thuja
occidentalis and vars.—E. N. A.—a little browning in some cases
orientalis var. aurea—about half killed. Some specimens IV 20%
Uninjured: occidentalis and vars.; orientalis, orientalis var. asplenifolia, Standishii
Thujopsis dolobrata—Cent. Japan—IV 25% **N**

Tsuga
caroliniana—Va. to Ga.—one specimen I; one specimen IV slight and V 75%; 2 specimens *uninjured*
diversifolia—Japan—V slight
Sieboldii—Japan—IV 10%
Uninjured: canadensis; **SKR:** '17–18

Taxaceae

Cephalotaxus drupacea—Japan—1 plant, 8 in. high, I; one plant 18 in. high, *uninjured* **N**
Podocarpus macrophylla—Japan—I **N**
Taxus
baccata var. repandens—IV slight
Uninjured: brevifolia, cuspidata

ANGIOSPERMAE

Dicotyledones

Aceraceae

Acer
Buergerianum—E. China, Japan—IV 100% A
campestre—Eu., W. Asia—IV 10% A
cappadocicum—Cauc. and W. Asia to Himalayas—IV 50% A
carpinifolium—Japan—III 25%; IV 25%
Davidi—C. China—III 75%—(Complicated by fungous trouble; may die)
macrophyllum—Alaska to Calif.—IV 90%—Terminal buds nearly all dead.
opalus—S. Eu.—IV 10%
palmatum—Korea, Japan—IV 100% A
ornatum—IV 100% A; **LK:** '19–20
Uninjured: ginnala, Negundo (**K:** '19–20), platanoides, Pseudoplatanus, rubrum, saccharum
Dipteronia sinensis—China—*uninjured*—slight protection **N**

Anacardiaceae

Rhus
canadensis—Eastern N. A.—IV 100% A
Cotinus—S. Eu. to Asia—IV 25%

javanica—China, Japan, Sandwich Is.—IV 100% A
verniciflua—Japan, China, Himalayas—IV slight
Uninjured: Potanini, punjabensis sinica, sylvestris, Vernix

Annonaceae

Asimina triloba—*Uninjured*

Aquifoliaceae

Ilex
Aquifolium—Eu. and Asia—IV 100%—Shooting out below dead part. **K:** '17–18; **SKR:** '19–20 **P**
balearica—7 plants averaging about 5 ft. high—II
heterophylla—IV 75%; V 90%; A **P**
cornuta—E. China—I **P**
crenata—Japan—IV 30–50%; V 15–50%—Varies much according to site
Fargesii—W. China—IV 50%; V 90%; **KG:** '17–18; **SKR:** '19–20 **P**
glabra—Mass. to Fla.—IV 10%; V 5% A
integra—Japan—I **P**
latifolia—Japan—II—A few old basal shoots apparently sound; **KG:** '17–18 **P**
opaca—N. A.—IV 5%; V 50%; **SKR:** '17–18
Uninjured: dubia (monticola), serrata, verticillata

Araliaceae

Acanthopanax
divaricatus—Japan—IV 90%—Occurs every year
Henryi—C. China—IV 90% A
pentaphyllus (Sieboldianus)—Japan—IV 10% A
Uninjured: ricinifolius
Aralia spinosa—*Uninjured*
Hedera helix—Eu. to Caucasus—V 40%; IV 100%, but *uninjured* where protected under mat of branches

Aristolochiaceae

Aristolochia durior—E. U. S.—IV slight

Berberidaceae

Berberis
aggregata—W. China—One specimen IV 90% A—other specimen III 50%; IV 100%; **SKR:** '17–18
Prattii—IV 50%
aristata—N.W. Himalayas—IV 10% A; **LK:** '19–20
atrocarpa—W. China—I (recently planted)
chinensis—Caucas.—IV 30% A
dasystachya—C. & N.W. China—one specimen *uninjured* —one specimen IV 50% A
Dielsiana—W. China—IV 10% A
Gagnepainii—W. China—IV 100%
ilicifolia—S. Chile—II
Julianae—C. China—IV 100%; **LK:** '19–20
Neuberti—(hort.)—IV slight A
Poiretii—N. China—IV 10% A; **SKR:** '19–20
polyantha—W. China—III 25%; IV 100% A
provincialis var. serrata—hort.—IV 75%
stenophylla var. compacta—hort.—II
thibetica—W. China—IV slight
Thunbergii—Japan—IV 25% A
atropurpurea—IV slight—In fine condition
minor—IV 90% A (in one site—elsewhere *uninjured*)
triacanthophora—C. China—III 90%
verruculosa—W. China—IV 90%
vulgaris x Thunbergii—IV 100% A
Wilsonae—W. China—Two specimens I; two specimens III 90%; **K:** '19–20; **SKR:** '19–20
Uninjured: amurensis var. japonica, circumserrata, diaphana, Henryana, Thunbergii var. minor, Vernae

Mahonia
Aquifolium—B.C. to Ore.—1 specimen *uninjured;* 1 specimen II; 1 specimen I; 4 specimens IV 100%; **KG:** '17–18; **SKR:** '19–20
Bealii—China—III 20%
pinnata—S.W. U. S. to Mex.—II

Nandina domestica—C. China to Japan—II **N**

Betulaceae

Alnus

glutinosa—Eu. & N. Asia—III 50%. 18 ft. high, several leaders, the tallest killed nearly to the base; many shoots from base. May be due to other causes

incana—Eu., Cauc., N. A.—IV 75%

rubra—Alaska to Calif., E. to Idaho—slight injury

Betula davurica, Ermani, glandulosa, japonica szechuanica, papyrifera, pendula, pendula purpurea, pubescens; all *uninjured*

Carpinus

Betulus var. quercifolia—(12 ft. high & 4 in. diam. at base). Upper 2/3 almost dead

Uninjured: Betulus (**LK:** '17–18), yedoensis

Corylus

americana—N. Eng. to Sask. and S. to Fla.—IV slight

colurna—S. Eu., Himalayas—IV 25%

maxima purpurea—IV slight

Bignoniaceae

Bignonia chinensis—China—IV 100% A

Catalpa

bignonioides—S.E. U. S.—IV slight. Large tree

nana—IV 100%—Dormant buds of last year unfolding

ovata—China—IV 25%; **LK:** '17–18

Uninjured—speciosa—Large tree

Buxaceae

Buxus

sempervirens var. suffruticosa—Some specimens *uninjured;* some V 20%; some I; with various intermediate conditions—These were transplanted in fall 1933, which may have a bearing on their condition in spring 1934. **P**

Uninjured: sempervirens—**K:** '19–20; **SKR:** '19–20

Pachysandra procumbens, terminalis—*Uninjured*

Calycanthaceae

Calycanthus
floridus—Va. to Fla.—IV slight A—In fine condition; **KG:** '17–18
occidentalis—Calif.—II. **KG:** '17–18; **LK:** '19–20
Meratia praecox—China—II **N**

Caprifoliaceae

Abelia
Graebneriana—China—I **N**
grandiflora—hort.—II **P** with chrysanthemum tops thrust among branches
Diervilla
rivularis—N. C. & Tenn. to Ga. & Ala.—IV slight; **SKR:** '19–20
sessilifolia—N. C. & Tenn. to Ga. & Ala.—IV slight; **K:** '19–20; **SKR:** '19–20
Dipelta floribunda—C. China—IV 100% A
Kolkwitzia amabilis—C. China—IV 100%—Flowers plentiful
Leycesteria formosa—Himal., S.W. China—I **N**
Lonicera
demissa—Japan—IV 10% A
Ferdinandi—N. China—IV 25%—Flowers abundant. Shrub 16 in. in diameter at base, 12 ft. high with spread of 18 ft. Also small specimen IV 100% A
fragrantissima—E. China—IV 100% A—Some of the flower buds were injured so that the flowers were fewer and sometimes abortive
gracilipes—Japan—IV 30%
Henryi—W. China—Badly injured; **K:** '19–20
japonica Halliana—E. Asia—Badly injured
Korolkovii—Turkestan—IV 75% A
Maackii—Manch., Korea—IV 60%—But in very fine condition. Large shrub (2 specimens) one 12 ft. high with spread of 18 ft. Flowers plentiful
Periclymenum—Eu., N. Afr., Asia Minor—II
pileata—C. & W. China—II
prolifera—Wisc. to Tenn.—IV 50%

quinquelocularis var. translucens—Himalayas to Afghanist.
—III 25%; IV 100%
Ruprechtiana—Manch., & N. China—IV slight
Standishii—China—IV slight—Shrub 10 ft. high with spread of 15 ft. Flowers plentiful
syringantha—N.W. China—IV slight
tatarica—S. Russia to Altai and Turkestan—IV 100% A—also one specimen *uninjured*
Webbiana—S.E. Eu. to Himalayas—IV 40%—Some leaves wilted after they came out
Xylosteoides—IV 25% A
Uninjured: chrysantha, chrysantha var. Regeliana, flava, Maximowiczii, nuendeniensis, Morrowii, muscaviensis, Xylosteum

Sambucus
canadensis—E. N. A.
acutiloba—IV 100% A
nigra—Eu., N. Afr., W. Asia
albo-variegata—III 30%; IV 100%
pyramidalis—IV 100% A
Uninjured: canadensis

Symphoricarpos
albus (racemosus)—N. N. A.—IV 100% A
microphyllus—Mex.—IV 90% A
occidentalis—Central N. A.—IV 100% A; **LK:** '17–18
Heyeri—IV 100% A
orbiculatus—N. J. to Ga., Kans. and Tex., W. to S. Dak.—IV 100% A; **LK:** '17–18

Viburnum *
affine—Que. to Ga.—IV 25% A
cotinifolium—Himalayas—III 50%
foetidum rectangulare—Asia—II **N**
ichangense—W. China—III 40%
nudum—L. I. to Fla. and La.—IV 75%
odoratissimum—S.E. Asia—I **P**
rhytidophyllum—W. China—II; **LK:** '17–18
rufidulum—S.E. U. S.—IV 50%

* In general, Viburnums that have been killed back will shoot up again from base.

Sargenti—N. China & Jap.—IV 50%—Not growing well
scabrellum—Pa. to Tex.—IV 10% A
theiferum—C. & W. China—IV 90% A; **LK:** '19–20
utile—C. China—1 plant I; 2 plants IV 100% **N**
Uninjured: acerifolium, burejaeticum, cassinoides (**K:** '17–18; **SKR:** '17–18), dilatatum, Lantana, Lentago, molle, Opulus, O. var. nana, prunifolium, tomentosum

Weigela
florida—N. China, Korea—IV 100% A—Flowers abundant
variegata—IV slight
hybrida—IV 50%—But abundance of flowers
Eva Rathke—IV 10% A
Uninjured: candidissima, japonica var. sinica

Celastraceae

Celastrus
angulata—China—II (2 upright shoots sprouting)
orbiculatus—China—IV slight A

Evonymus
Bungeana—China & Manch.—IV slight A
semipersistens—IV 100%. Looks unhealthy; shooting out along trunks; may have been winterkilled in trunks
hians—Japan—IV 25% A
japonica—S. Japan—I; **KG:** '17–18 **P**
nana—Eu. to W. Asia—III 50%; **LK:** '19–20
patens—China—IV 75% A
Uninjured: alata, alata var. compacta, europaea, verrucosa

Cercidiphyllaceae

Cercidiphyllum japonicum—Japan—IV slight A—In fine condition

Euptelea
Franchetii—C. China—IV slight A
polyandra—Japan—IV slight A

Cistaceae

Cistus laurifolius—Mediterr. region—I **N**
Helianthemum
(hort. forms)—III 50 to 100% **P**
nummularium var. macranthum—Eu., W. Asia—Some specimens I; others II 50% **P**

Compositae

Artemisia
austriaca—S.E. Eu.—III 50%
procera—S.E. Eu. & Asia Minor—III 50%
Baccharis halimifolia—Mass. to Tex.—III 25%; some II; **SKR**: '17–18

Coriariaceae

Coriaria japonica—II; **KG**: '17–18

Cornaceae

Aukuba japonica—Himalayas to Japan—II **P**
Cornus (many species omitted)
kousa—Japan, Korea—IV 10%
macrophylla—Himalayas, China, Japan—IV 10%
paucinervis—C. China—III 50%
Uninjured: mas
Davidia involucrata—W. China—III 25%; IV 10%. Looks unhealthy. Shooting out from trunk as if cambium had been injured. Some of leaves curled. Tree 7 in. diam. at base; 15 ft. high
Helwingia japonica—China, Japan—IV 15%

Ebenaceae

Diospyros Lotus—Asia—II **N**

Elaeagnaceae

Elaeagnus angustifolia—*Uninjured*
Shepherdia argentea—Prairie States—IV 25%

Ericaceae

Arctostaphylos Uva-ursi—*Uninjured*
Calluna
vulgaris—N. Eu. & Asia Minor—I
alba—I 75% of plants
Clethra alnifolia (**SKR**: '17–18) and barbinervis: *Uninjured*
Enkianthus perulatus (**K**: '17–18; **SKR**: '17–18) and campanulatus: *Uninjured*
Erica carnea—C. & S. Eu.—I & II. New shoots from part protected by snow
Kalmia
angustifolia—E. U. S. & Can.—V 5%
latifolia—E. U. S. & Can.—III 5%; V 5%
Leucothoe
Catesbaei—S.E. U. S.—IV 25%; V 25%
racemosa—E. & S. U. S.—Flower buds almost entirely killed; **SKR**: '17–18
Pieris
floribunda—Va. to Ga.—IV 50%; **SKR**: '17–18
japonica—Japan—Flower buds almost entirely killed; **SKR**: '17–18
Rhododendron
(hort. forms)—V 25%; flower buds uninjured; some plants I
(hort. forms "Azalea")—IV 25%
carolinianum—N. C.—In poor condition previously; others *uninjured*
catawbiense—Va. to Ga.—IV and V slight A
maximum—N. S. & Ont. to Ga., La., & Ohio—IV and V slight A
Uninjured: nudiflorum, viscosum.

Eucommiaceae

Eucommia ulmoides—*Uninjured;* tree 16 in. at base; 18 ft. high; **LK**: '19–20

Euphorbiaceae

* Andrachne colchica—Asia Minor—IV 100% A
Daphniphyllum macropodum—Japan, Korea, China—I **N**
* Securinega
    * flueggeoides—China & Japan—IV 100% A
    * ramiflora—Asia—IV 100% A

Fagaceae

Castanea
    mollissima—China & Korea—IV slight A
    sativa—S. Eu., W. Asia, N. Afr.—II (Two-year seedlings in nursery)
Fagus
    orientalis—Asia Minor to N. Persia—IV slight A
    Sieboldii—Japan—IV slight
    Uninjured: sylvatica, sylvatica vars. atropunicea, Riversi, zlatia
Quercus
    aliena var. acutiserrata—IV slight
    hispanica var. lucombeana—S. Eu.—Three individuals: 2, IV 90%; 1, IV 100%
    Michauxii (Prinus)—Del. to Tex.—IV 100% A
    phellos—N. Y. to Tex.—Upper half dead
    Robur var. fastigiata—IV 100%. Mostly back to 1932 growth
    undulata—Colo. to Nev. & Tex.—IV 100% A
    Uninjured: alba, dentata, Gambelii, glandulifera, heterophylla, imbricaria, lyrata, macrocarpa, Robur

Flacourtiaceae

Idesia polycarpa—S. Japan & C. & W. China—(staminate form)—Two specimens, both 7 in. diam. at base—I; (pistillate form)—Two specimens, one 8 in. diam. at base and 15 ft. high—IV 100%. Shooting out from buds near base of last year's (1932) growth. Many short branches dead, but

* These species (which are low shrubs) probably die back a little each year.

will recover. Other 6 in. diam. at base, 13 ft. high—III 25%; IV 100%. May recover, but very doubtful. Shooting out from sides of old branches.

Garryaceae

Garrya elliptica—Oreg. to Calif.—I **N**

Guttiferae

Hypericum densiflorum—N. J. to Fla., Mo. & Tex.—III 50%

Hamamelidaceae

Corylopsis
pauciflora—Japan—IV 50%; **LK:** '17–18; **SKR:** '19–20
spicata—Japan—IV 100% A
Fothergilla major—*Uninjured*
Hamamelis japonica, vernalis, & virginiana—*Uninjured*
Liquidambar Styraciflua—*Uninjured*
Loropetalum chinense—China—I—(had survived winter 1932–1933) **N**
Parrotia persica—Persia—IV slight A. One tree 6–8 in. diam. at base & 25 ft. high; another shrubby specimen 12 ft. high. Both in fine condition. **SKR:** '19–20
Parrotiopsis Jacquemontiana—Himalayas—II—Tree 9 ft. high
Sinowilsonia Henryi—China—IV 100% **N**

Hippocastanaceae

Aesculus Hippocastanum, Baumanii, hybrida, parviflora, Pavia, & turbinata—*Uninjured*

Juglandaceae

Platycarya strobilacea—China—III 50%; in nursery II
Pterocarya fraxinifolia—Cauc. to N. Persia—IV slight A (8 in. diam. at base and about 12 feet high)
Uninjured: Carya spp., Juglans spp.

Lardizabalaceae

Akebia quinata—China & Japan—IV 100% A
Decaisnea Fargesii—W. China—III 50%; IV 100% A

Lauraceae

Laurus nobilis—Mediterr. Region—II **N**

Leguminosae

Albizzia julibrissin—Persia to C. China—IV 100%. Very slow coming out
Amorpha
fruticosa—E. & S. U. S.—IV 100% A. Shoots killed back 4 or 5 in.
glabra—N. C. to Ala.—IV 15%
tennesseeensis—S. U. S.—Nearly dead, excepting a few buds on branches, and many shoots from base
Campylotropis macrocarpa—N. and C. China—I & II
Caragana ambigua, arborescens, arborescens var. Lorbergii, Boisii, chamlagu, decorticans, frutex, grandiflora, Maximowicziana, & microphylla—*Uninjured*
Cercis chinensis—C. China—IV slight A; **KG**: '17–18; **SKR**: '19–20
Cladrastis lutea—*Uninjured*
Colutea
orientalis—S.E. Eu. & Asia—I
istria—Asia Minor—IV 100% A
Coronilla Emerus—C. & S. Eu.—IV 100%; V 75%; at north side, II
Cytisus
hirsutus—S.E. Eu.—IV 100% A
praecox—hort.—one specimen III 50%; another II; others IV 50%. Individuals vary. North side most affected. **P**
scoparius—C. & S. Eu.—I
Genista hispanica—Spain to N. Italy—III 75% **N**
Gleditsia
aquatica—S. C. to Texas—IV 100%
caspica—Transcauc. to N. Persia—IV 100%

triacanthos—W. N. Y. to Tex.—IV 30% A. Tree 6 in. diam. at base, 20 ft. high. **LK**: '17–18

Uninjured: japonica (horrida)

Gymnocladus dioica—N. Y. to Okla.—IV 100%. Slight dying back at tips of branches an ordinary occurrence each year

Laburnum Watereri—hort.—IV 100% A

Maackia amurensis—*Uninjured*

Robinia

Pseudoacacia—E. U. S.—IV slight A

Decaisneana—IV slight A

Rehderi—IV 20% A

Uninjured: fertilis, hispida, Pseudoacacia var. Bessoniana, Pseudoacacia var. Holdtii

Sophora japonica—*Uninjured*

Ulex europaeus—C. & W. Eu.—II **P**

Wistaria, all spp.—IV 100% A

Leitneriaceae

Leitneria floridana (pist. form)—Fla. to Tex.—IV slight

Loganiaceae

Buddleia

albiflora (Hemsleyana)—China—II

Colvillei—Himal.—II

Uninjured: alternifolia

Lythraceae

Lagerstroemia indica—China—II **N**

Magnoliaceae

Kadsura japonica—Japan, Korea—II **N**

Magnolia

grandiflora—N. C. to Fla.—One specimen nearly dead; one half dead; two others V 100% but buds uninjured. **P**

liliflora—China—IV 10%

Uninjured: macrophylla (small tree in sheltered site), parviflora, Soulangeana, stellata, tripetala

Malvaceae

Hibiscus syriacus—China, India—IV 80%

Meliaceae

Cedrela sinensis—China—Two specimens, one 20 ft. high, 10 in. diam. at base; other 30 ft. high, 16 in. diam. at base. Larger one more injured, but both in good condition June 24. One: IV 50%. New growth starting in most cases from dormant buds, often many years back (e.g. one 10 yrs. back); also from accessory buds at base of terminal bud. Other: IV 35%. New growth starting in many cases from dormant buds a few years back, but not so many terminal buds killed as in above.—Young tree in nursery, 6 ft. high. II

Menispermaceae

Cocculus carolinus—Va. & Ill. to Fla. & Tex.—IV 100% A. **K**: '19–20

Menispermum
canadense—E. N. A.—IV slight
dahuricum—China & Japan—IV 100% A

Sinomenium acutum var. cinerascens—Japan & China—IV 100% A

Moraceae

Broussonetia papyrifera (pist. form)—China & Japan—about 2/3 dead; **LK**: '17–18

Broussonetia papyrifera (stam. form) China & Japan—about 9/10 dead. This specimen was blown over in Aug. 1933, which may account for greater winter injury

Ficus carica—W. Asia—II **P**

Maclura pomifera—Ark. to Okla. & Tex.—IV 100% A

Morus
acidosa—China & Japan—IV 100%
alba var. tatarica—Asia—IV slight

cathayana—C. and E. China—A weak specimen; only one branch living; **SKR**: '17–18
mongolica (stam. form)—China—IV 100%. In excellent condition
Uninjured: alba var. pendula

Myricaceae

Myrica caroliniensis—*Uninjured*

Oleaceae

Chionanthus
retusa—China—IV 10% A
virginica—Pa. to Fla. & Tex.—IV 100% A
Fontanesia
Fortunei—China—IV 100% A; **SKR**: '19–20
phillyreoides—W. Asia—IV 100% A
Forestiera
ligustrina—S.E. U. S.—IV 10%
neo-mexicana—S.W. U. S.—IV slight
Forsythia
intermedia spectabilis—30% of flower buds killed—IV 100%
Uninjured: suspensa Fortunei
Fraxinus excelsior—*uninjured*
Jasminum
fruticans—S. Eu., N. Afr.—I **N**
nudiflorum—China—IV 100%; **KG**: '17–18; **SKR**: '17–18; **SKR**: '19–20
Ligustrum
* ovalifolium—Japan—Young hedges IV slight. Older hedges II & III, in varying percentages. Frequent clipping during growing season seems to render this sp. more susceptible to winter injury.
sinense—China—almost entirely dead. **SKR**: '17–18
strongylophyllum—C. China—II **P**

* This privet and L. vulgare do not seem to be as much affected in the Garden as in the immediate vicinity.

vulgare—Eu., N. Afr.—IV slight
atrovirens—IV slight
Osmanthus
armatus—W. China—II **N**
ilicifolius—Japan—II **P**
Phillyrea decora—W. Asia—II **N**
Syringa
japonica—Japan—IV 90% A
persica—Persia to N.W. China—IV 90% A
tomentella—W. China—IV 100% A
villosa—N. China—III 75%. Many new shoots killed but some in good condition and going to bloom
Uninjured: (hort. forms)

Plumbaginaceae

Ceratostigma Willmottianum—W. China—I **N**

Polygonaceae

Polygonum Aubertii—China—IV 100% A

Ranunculaceae

Clematis Vitalba—Eu., N. Afr., Cauc.—IV 50%
Other Clematis spp. killed back a little, but in good condition
Paeonia suffruticosa—N.W. China—IV 100%. Some killed back considerably
Zanthorhiza apiifolia—N. Y. to Ky. & Fla.—IV 50% A

Rhamnaceae

Berchemia racemosa—Japan, Formosa—II **P**
Ceanothus americanus—Canada & E. & Cent. U. S.—III 75%
Hovenia dulcis—China—II **P**
Paliurus spina-Christi—S. Eu. and Asia—II **N**
Rhamnus
imeretina—Cauc., W. Asia—IV very slight
Uninjured: cathartica, Frangula
Zizyphus jujuba—S.E. Eu. to S. and E. Asia—IV 90% **P**

Rosaceae *

Exochorda
Korolkowii—Turkestan—IV 100% A
Uninjured: Giraldii
Kerria
japonica—E. Asia—IV 100% A
picta (variegated form)—IV 100% A
Physocarpus
glabratus—Colo.—About half dead
opulifolius—Que. to Va., Tenn. & Mich.—IV 25%. Some shoots died back long distance
Rhodotypos kerrioides—Japan, C. China—IV slight A. In fine condition
Rosa (Includes only species and vars. in systematic section)
alba—slight injury
Carter's Annual—III 50%
centifolia—E. Cauc. III 50%; **LK**: '19–20
Hugonis—C. China—IV 25%
rugosa—N. China, Korea, Japan—slight injury
Uninjured: californica, multiflora cathayensis

Amount of Winter Killing Among Climbing Roses in Rose Garden †

Albertine—III 50%
Alida Lovett—all old wood killed. Many well ripened young shoots alive
American Pillar—Much injured in exposed places
Auguste Roussel—*Uninjured*
Aviateur Blériot—III 70%
Baltimore Belle—*Uninjured*
Ben Stad—III 75%
Bess Lovett—III 75%. Still dying back (June 22d)
Blaze—III 70% **P**
Bloomfield Courage—III 50%. Sparse flowering
Bonnie Prince—*Uninjured*

* Many members of this family die back a little in ordinary winters.

† Data supplied by Mr. Montague Free, Horticulturist of the Brooklyn Botanic Garden.

Breeze Hill—III 50%. Still dying back (June 22d)
Carmine Pillar—III 50% **P**
Chaplin's Pink Climber—*Uninjured*
Christine Wright—*Uninjured*
Cl. American Beauty—IV 100%
Cl. Gruss an Teplitz—II
Cl. Lady Ashtown—III 50 to 75%
Cl. Los Angeles—II **P**
Cl. Mme. Caroline Testout—III 75%
Cl. Ophelia—I **P**
Cl. Orleans—IV 100%. Still dying back (June 22d)
Cl. Richmond—III 50% **P**
Comtesse Prozor—I
Coralie—III 75%
Coronation—*Uninjured*
Crimson Rambler—Laterals killed
Dorothy Perkins—*Uninjured*
Dr. Huey—Some shoots killed; poor blossoming
Dr. W. Van Fleet—IV 100%. Much injured in exposed places
Emile Fortépaule—Old wood and immature shoots killed. Rest uninjured
Emily Gray—I & II
Evangeline—*Uninjured*
Excelsa—Some canes killed
Félicité et Perpetué—IV 100% **P**
Freifrau von Marschall—*Uninjured*
Gardenia—III 75%
Ghislaine de Feligonde—*Uninjured*
Gloire de Dijon—III 50% **P**
Hiawatha—*Uninjured*
Hildenbrandseck—III 75%. Perhaps partly due to attack of scale insects in 1933
Jacotte—III 90% **P**
Lambertiana Roses—*Uninjured*
Le Rêve—*Uninjured*
Lessing—*Uninjured*
Marietta Silva Tarouca—*Uninjured*

Mary Lovett—Some shoots alive near top; some killed to ground. Older wood suffered most
Mary Wallace—III 50%
Max Graf—*Uninjured*
Mermaid—II **P**
Milky Way—*Uninjured*
Miss Flora Mitten—*Uninjured*
Mme. Auguste Nonin—*Uninjured*
Mme. Grégoire Staechelin—II
Multiflora cathayensis—*Uninjured*
New Dawn—IV 100%
Non plus ultra—IV 100%
Papa Gouchault—IV 100%. Bloomed well
Papa Rouillard—*Uninjured*
Paul Nöel—Oldest canes killed
Paul's Scarlet Climber—Laterals dead, and some main shoots. Fairly good bloom
Pemberton Roses—III 75%
Philadelphia—III 75%
Primevère (Primrose)—III 75%
Prosperity—Old canes killed
Reine Marie Henriette—III 40% **P**
Renée Danielle—III 70% **P**
Romeo—III 75%
Rosa rugosa repens alba—*Uninjured*
Rosella—II. Newly planted
Ruga—III 70%. Newly planted **P**
Schneelicht—*Uninjured*
Scorcher—II **P** in March
Silver Moon—III 50–75%
Star of Persia—*Uninjured*
Tausendschön—*Uninjured*
The Beacon—Half top growth killed **P**
Thelma—*Uninjured*
Veilchenblau—IV 100%
Wichuraiana—One shipment III 90%. Rest uninjured
Wichmoss—*Uninjured*

Zephirine Drouhin—III 75%
Rubus
adenophorus—C. China—III 50% A
allegheniensis—N. S. to N. C. & Ark.—IV 100%
biflorus—Himalayas—IV 100% A
deliciosus—Colo.—IV 100% A
occidentalis—N. B. to Minn. and s. to Ga. & Colo.—III 75% A
odoratus—N. S. and N.E. U. S.—IV 100% A
phoenicolasius—N. China & Japan—III 50%; IV 100% A
Sorbaria
Aitchisonii—W. Asia—II
arborea var. glabrata—IV 100% A
assurgens—China?—IV 100%. Rather badly killed back
Lindleyana—Himalayas & China—II
sorbifolia—N. Asia from Ural to Japan—IV 100% A
stellipila—IV 100% A
Spiraea
albiflora—Japan—II
Billiardii—(S. Douglasii x S. salicifolia)—hort.—III 50%; IV 100% half dead. **SKR**: '19–20
bumalda Anthony Waterer—hort.—IV 100% A; **LK**: '19–20
cantoniensis—China, Japan—IV 15%. One very good condition; another, IV 100%, about half dead; **SKR**: '19–20
fl. pl.—III 50%; IV 100%. Half dead
chamaedryfolia—N.E. Asia—IV 100% A
crenata—S. Eu. & W. Asia—IV 75% not severe
fontenaysii—hort.—III 50%; IV 100%
rosea—IV 100% A
gemmata—N.W. China—IV 100% A
Henryi—C. & W. China—One specimen IV slight A; another III 50%, IV 100%, half dead; **K**: '19–20; **LK**: '19–20
hypericifolia—S.E. Eu. to Sib.—IV 100% A
japonica atrosanguinea—Japan—IV 100% A
Margaritae—hort.—IV 100% A; **LK**: '19–20

Menziesii—Alaska to Ore.—IV 100% A
prunifolia var. plena—IV 100%. About half dead
Sargentiana—W. China—IV 100% A
superba—hort.—III 50%; IV 100%; half dead
Thunbergii—Japan & China—IV 100% A (Injury slight)
tomentosa—N. S. to Ga., w. to Man. & Kans.—IV 100% A
Veitchii—China—IV 25% A
Wilsonii—C. & W. China—IV 50% A
Uninjured: nipponica, Vanhouttei (in some sites IV 90% A)

Stephanandra
incisa—Japan and Korea—2 specimens about ½ dead; one specimen only slight injury

Rosaceae

(Pomoideae)

Amelanchier spicata—*Uninjured*

Aronia
arbutifolia—Mass. to Fla., w. to Minn. and Tex.—IV slight. A sickly plant
Uninjured: melanocarpa var. elata

Chaenomeles lagenaria, Maulei, Maulei var. alpina, sinensis—*Uninjured*

Cotoneaster
Dielsiana—C. China—IV 30% (another *uninjured*)
Francheti—W. China—II
horizontalis—China—one specimen half killed; one II; others *uninjured*
microphylla—Himalayas—II
Uninjured: divaricata, foveolata, hupehensis, integerrima, lucida, nitens, racemiflora, racemiflora var. songarica, tomentosa, Zabeli

Crataegus
pedicellata—Pa. to Conn., N. Y. & Ont.—IV 50% A
Uninjured: arnoldiana, coccinioides, durobrivensis, Lavallei, Oxyacantha, phaenopyrum, pinnatifida, and others

Cydonia oblonga—*Uninjured*

Malus arnoldiana, atrosanguinea, baccata var. mandshurica, coro-

naria, floribunda, micromalus, prunifolia, prunifolia var. fastigiata, pumila, pumila var. Niedzwetzkyana, Scheideckeri, Sieboldii var. arborescens, sikkimensis, Soulardi, theifera, toringoides—*Uninjured*

Mespilus germanica—*Uninjured*

Photinia

serrulata—China—II **N**

villosa—*Uninjured*

Pyracantha coccinea—Italy to W. Asia—II. Nine large specimens

Pyrus communis, phaeocarpa var. globosa, ussuriensis—*Uninjured*

Raphiolepis umbellata—S. Japan—I **N**

Sorbus Aucuparia, intermedia—*Uninjured*

Stranvaesia Davidiana—W. China—I **N**

Rosaceae

(Prunoideae)

Prinsepia sinensis, uniflora; **KG**: '17–18—*Uninjured*

Prunus

Armeniaca—W. Asia—IV slight

avium—Eu. & W. Asia—IV slight (large tree)

Conradinae—C. China—about half dead and shooting up from trunks and branches throughout. Tree shrubby, from a low trunk, 1½ ft. in diam. at base and 15 ft. high

Laurocerasus—S.E. Eu. & Asia Minor—2 specimens, I & II **P**

orthosepala—Kansas—IV slight

Persica (on Kansuensis) (var. "nectarine")—III 50%; IV 100%. About half dead; **K**: '17–18

nucipersica—(2 specimens)—IV 75% A (forming fruit)

pilosiuscula media—W. China—IV 25% A

pumila—N. Y. to Wis.—IV slight

umbellata—S. C. to Fla.—III 25%; another specimen *uninjured*

Uninjured: americana, Besseyi, cerasifera, cerasifera var.

Pissartii, domestica, hortulana, Maackii, maritima, Maximowiczii, Padus, pseudocerasus, serrulata var. fugenzo, Simonii, subhirtella, tomentosa, triloba, utahensis

Rubiaceae

Cephalanthus occidentalis—N. Brunswick to Calif. and s.—IV 50% A

Rutaceae

Evodia
hupehensis—China—IV 25% A
Uninjured: Daniellii

Phellodendron
amurense—N. China, Manch.—IV slight
sachalinense—Sachalin I. to China—III 90%
Uninjured: chinense, japonicum

Poncirus trifoliata—N. China—3 specimens IV 50% A. mostly lower branches; 1 specimen, large fruited, I; **K**: '17–18; **SKR**: '17–18

Ptelea trifoliata (**SKR**: '17–18), trifoliata var. mollis—*Uninjured*

Skimmia japonica—Japan—one specimen I; one specimen II. Planted in fall of 1933. **P**

Zanthoxylum
Bungei—China—7 in. diam. at base—II
piperitum—N.E. Asia—7 in. diam. at base—I
Uninjured: americanum

Salicaceae

Populus spp.: all *uninjured*

Salix spp. *uninjured*
purpurea—Eu.—IV 100% A; one specimen III 50%

Sapindaceae

Koelreuteria
apiculata—C. China—IV slight
paniculata—China, Korea, Japan—IV slight

Xanthoceras sorbifolia—*Uninjured*

Saxifragaceae

Deutzia
Lemoinei—hort.—IV 25% A
rosea var. campanulata—hort.—IV 100% A
scabra—Japan, China—II: another IV 25% A; **LK:** '17–18
candidissima—II
Schneideriana var. laxiflora—C. China—II
Vilmorinae—hort.—II
Uninjured: grandiflora
Hydrangea
arborescens var. sterilis—IV 100% A
cinerea—S.E. U. S.—IV 30% A
macrophylla—Japan, Korea—II A **P**
mandshurica—Manchuria, Japan—II A
paniculata—Japan & China—IV slight A
Uninjured: Bretschneideri, paniculata var. grandiflora, quercifolia
Itea virginiana—N. J. to Tex.—IV 100%; **SKR:** '17–18
Philadelphus
coronarius—S.E. Eu. to Cauc.—IV 25% A; other specimens *uninjured*
grandiflorus—N. C. & Tenn. to Fla. & Ala.—IV slight A
incanus—W. China—IV 50% A
laxus—Ga.—IV 15% A.
Lemoinei—hort.—IV 50% A. In good condition; **LK:** '17–18
Lewisii—N.W. U. S.—IV 100%; severe; **LK:** '19–20
Magdalenae—W. China—IV 80%
nivalis—hort.—IV slight A
satsumanus—Japan—III 50%; IV 50%
Schrenkii var. Jackii—N. China & Korea—IV 100%. About half dead
verrucosus—hort.—IV slight A
virginalis—hort.—IV 75% A
Uninjured: Falconeri, pubescens
Ribes
americanum—N. S. to Va. and w.—II

Culverwellii (R. nigrum x Grossularia)—hort.—IV 75% A
divaricatum—B. C. to Calif.—IV slight
Gordonianum—hort.—IV 50%; **SKR:** '19–20
Grossularia—Eu., N. Afr., Cauc.—IV slight A; **SKR:** '19–20
leptanthum—S.W. U. S.—III 50%
odoratum—Cent. U. S.—IV 50%; **SKR:** '19–20
petraeum—Mts. of W. & C. Eu.—IV 50% A
robustum—hort.—III 50%; IV 100% A; **SKR:** '19–20
sanguineum—B. C. to N. Calif.—II **P**
sativum var. macrocarpum aureum—IV 50% A
tenue—China & Himalayas—IV 25% (on north side)
Uninjured: alpinum, curvatum, fasciculatum, luridum, niveum, ussuriense

Simaroubaceae

Ailanthus
Giraldii—W. China—IV slight—8 in. diam. at base, 25 ft. high
Vilmoriniana—W. China—IV slight—25 ft. high, 1 ft. at base—Probably not more than usually happens
Picrasma quassioides—China & Japan—IV slight A

Solanaceae

Lycium halimifolium—S.E. Eu. to W. Asia—IV 90% A; **SKR:** '19–20

Stachyuraceae

Stachyurus
chinensis—China—II
praecox—Japan—II; **LK:** '17–18

Staphyleaceae

Staphylea
bumalda—Japan—IV 100%
colchica—Caucasus—IV 25%
Coulombieri—IV 50%
Uninjured: pinnata, trifolia

Sterculiaceae

Firmiana simplex—China & Japan—Branches killed, but much of trunk apparently sound and may shoot up later from base. (Tree 4 in. in diam. at base and 18 ft. high) **P**

Styracaceae

Halesia carolina—*Uninjured;* **LK:** '19–20

Symplocaceae

Symplocos paniculata—E. Asia—IV slight

Tamaricaceae

Tamarix
- hispida—From east of Caspian Sea to Songaria—III 75%
- odessana—Caspian region—III 50%; **K:** '19–20
- parviflora—S.E. Eu.—III 90%
- pentandra—S.E. Eu. to C. Asia—IV 75%

Theaceae

Gordonia Alatamaha—IV 100%—Only last year's growth killed—Dormant buds of 1932 shooting. **P**

Stewartia pentagyna—*Uninjured;* **P**

Thymelaeaceae

Daphne
- caucasica—Cauc.—I **N**
- genkwa—China—I & II **P**
- Mezereum—Eu. to Caucasus—IV slight

Dirca palustris—*Uninjured*

Tiliaceae

Tilia
- euchlora—hort.—IV 10%
- *Uninjured:* cordata, Moltkei, neglecta, tomentosa, vulgaris

Ulmaceae

Celtis
rugosa (Douglasii)—W. U. S.—IV slight
Uninjured: sinensis
Ulmus
foliaceae var. suberosa—IV slight
Uninjured: foliacea var. Koopmannii, glabra var. Camperdownii, parvifolia, procera, pumila
Zelkova
Verschaffeltii—IV 50% A
Uninjured: serrata, ulmoides (carpinifolia)

Verbenaceae

Callicarpa
Giraldiana—China—II
japonica—Japan—Two specimens II; one smaller specimen 6 ft. high—IV 100% A
Caryopteris incana—E. China & Japan—II **P** (I in nursery)
Clerodendron trichotomum—E. China & Japan—II 75%—Small shoots coming up in a radius of 4 ft. from plant **SKR**: '17–18
Vitex
Agnus-castus—S. Eu. & W. Asia—II; **KG**: '17–18; **LK**: '19–20
alba—II
Negundo incisa—N. China & Mongolia—II

Arthur Harmount Graves
Curator of Public Instruction

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GENERAL INFORMATION

Membership.—All persons who are interested in the objects and maintenance of the Brooklyn Botanic Garden are eligible to membership. Members enjoy special privileges. Annual Membership, $10 yearly; Sustaining Membership, $25 yearly; Life Membership, $500. Full information concerning membership may be had by addressing *The Director, Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, N. Y.* Telephone, Prospect 9-6173.

The Botanic Garden is open free to the public daily from 8 a.m. until dusk; on Sundays and Holidays it is open at 10 a.m.

Entrances.—On Flatbush Avenue, near Empire Boulevard and near Mt. Prospect Reservoir; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

The street entrance to the Laboratory Building is at 1000 Washington Avenue, opposite Crown Street.

To Assist Members and others in studying the collections the services of a docent may be obtained. This service is free of charge to *members of the Botanic Garden;* to others there is a charge of 50 cents per person. Arrangements must be made by application to the Curator of Public Instruction at least one day in advance. No parties of less than six adults will be conducted.

To Reach the Garden take Broadway (B.M.T.) Subway to Prospect Park Station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, or Tompkins Avenue trolleys to Washington Avenue; St. John's Place trolley to Sterling Place and Washington Avenue; Union Street or Vanderbilt Avenue trolleys to Prospect Park Plaza and Union Street. By Automobile from points on Long Island take Eastern Parkway west and turn left at Washington Avenue; from Manhattan, take Manhattan Bridge, follow Flatbush Avenue Extension and Flatbush Avenue to Eastern Parkway, turn left following Parkway to Washington Avenue; then turn right.

BROOKLYN BOTANIC GARDEN
PUBLICATIONS

RECORD. Established, January, 1912. An administrative periodical issued quarterly (1912–1928); bimonthly (1929–1932); quarterly (1933–). Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, guides, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others $1.00 a year. Circulates in 59 countries.

MEMOIRS. Established, July, 1918. Published irregularly. Circulates in 47 countries.

Volume I. *Dedication Papers:* comprising 33 scientific papers presented at the dedication of the laboratory building and plant houses, April 19–21, 1917. 521 pages. Price $3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. By Norman Taylor, June 11, 1923. 108 pages. Price $1.00, plus postage.

Volume III. Vegetation of Mount Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor, June 10, 1927. 151 pages. Price $1.60.

CONTRIBUTIONS. Established, April 1, 1911. Papers originally published in periodicals, reissued as "separates," without change of paging, and numbered consecutively. Twenty-five numbers constitute one volume. Price 25 cents each, $5.00 a volume. Circulates in 34 countries.

64. Inheritance of resistance to loose and covered smut in hybrids of Hull-less with Early Gothland and Monarch oats. 28 pages. 1932.

65. Monographic studies in the genus Eleocharis—II. 34 pages. 1932.

66. Inheritance of resistance to loose and covered smut in hybrids of Black Mesdag with Hull-less, Silvermine, and Early Champion oats. 14 pages. 1934.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each. Circulates in 28 countries.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication. Issued as numbers of the RECORD; see above.

Guide No. 5. The Rock Garden. 28 illustrations. Price, 35 cents. By mail, 40 cents.

Guide No. 6. Japanese potted trees (Hachinoki). 11 illustrations. Price, 35 cents. By mail, 40 cents.

Guide No. 7. The story of our boulders: Glacial geology of the Brooklyn Botanic Garden. 22 illustrations. Price, 35 cents. By mail, 40 cents.

Guide No. 8. The story of fossil plants. 8 illustrations. Price, 35 cents. By mail, 40 cents.

SEED LIST. (*Delectus Seminum*) Established, December, 1914. Since 1925 issued each year in the January number of the RECORD. Circulation includes 160 botanic gardens and institutions located in 40 countries.

AMERICAN JOURNAL OF BOTANY. Established, January, 1914. Published, in coöperation with the BOTANICAL SOCIETY OF AMERICA, monthly, except during August and September. Subscription, $7.00 a year. Circulates in 53 countries.

ECOLOGY. Established, January, 1920. Published quarterly in coöperation with the ECOLOGICAL SOCIETY OF AMERICA. Subscription, $4.00 a year. Circulates in 48 countries.

GENETICS. Established, January, 1916. Bimonthly. Subscription, $6.00 a year. Circulates in 37 countries.

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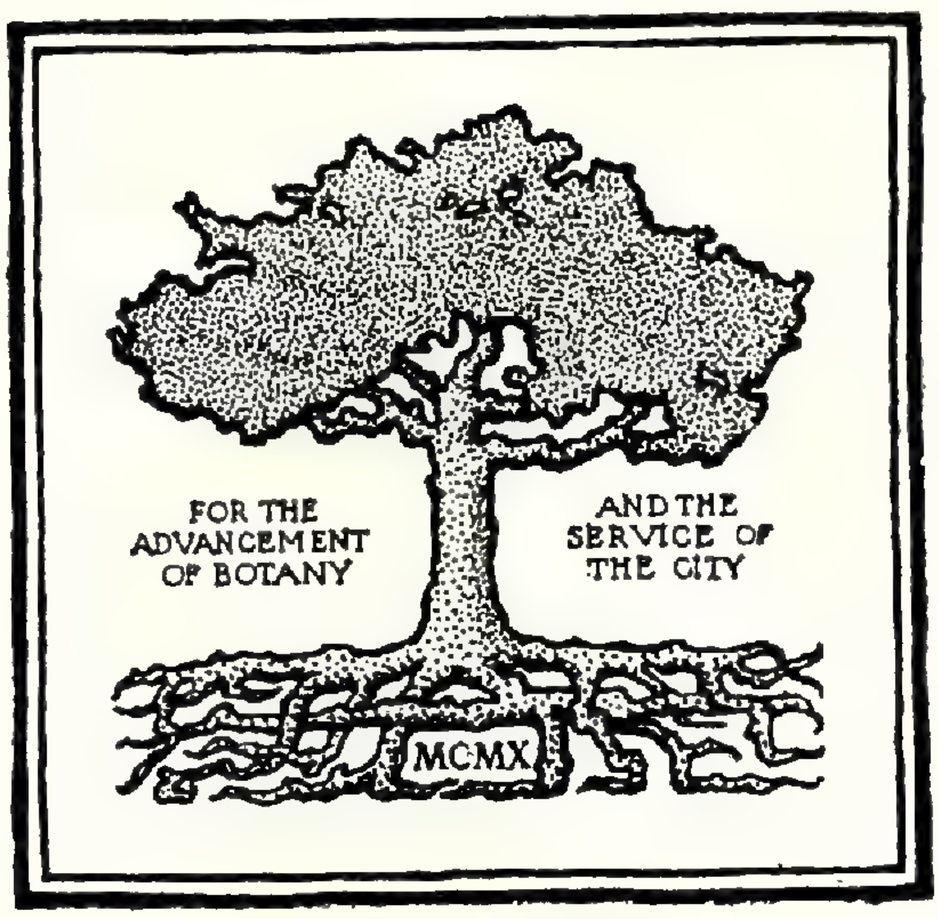

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INFORMATION CONCERNING MEMBERSHIP

The Brooklyn Institute of Arts and Sciences is organized in three main departments: 1. The Department of Education. 2. The Museums. 3. The Botanic Garden.

Any of the following seven classes of membership may be taken out through the Botanic Garden:

1.	Annual member	$ 10
2.	Sustaining member	25
3.	Life member	500
4.	Permanent member	2,500
5.	Donor	10,000
6.	Patron	25,000
7.	Benefactor	100,000

Sustaining members are annual members with full privileges in Departments one to three. Membership in classes two to seven carries full privileges in Departments one to three.

In addition to opportunities afforded to members of the Botanic Garden for public service through coöperating in its development, and helping to further its aims to advance and diffuse a knowledge and love of plants, to help preserve our native wild flowers, and to afford additional and much needed educational advantages in Brooklyn and Greater New York, members may also enjoy the privileges indicated on the following page.

Further information concerning membership may be had by addressing The Director, Brooklyn Botanic Garden, Brooklyn, N. Y., or by personal conference by appointment. Telephone, Prospect 9–6173.

PRIVILEGES OF MEMBERSHIP

1. Free admission to the buildings and grounds at all times.
2. Cards of admission for self and friends to all exhibitions and openings preceding the admission of the general public, and to receptions.
3. Services of docent (by appointment), for self and party (of not less than six), when visiting the Garden.
4. Admission of member and one guest to field trips and other scientific meetings under Garden auspices, at the Garden or elsewhere.
5. Free tuition in most courses of instruction; in other courses a liberal discount from the fee charged to non-members.
6. Invitations for self and friends to spring and fall "Flower Days," and to the Annual Spring Inspection.
7. Copies of Garden publications, as follows:
   a. RECORD (including the ANNUAL REPORT).
   b. GUIDES (to the Plantations and Collections).
   c. LEAFLETS (of popular information).
   d. CONTRIBUTIONS (on request. Technical papers).
8. Announcement Cards (Post Card Bulletins) concerning plants in flower and other items of interest.
9. Privileges of the Library and of the Herbarium.
10. Expert advice on the choice and care of ornamental trees, shrubs, and herbaceous plants, indoors and out; on planting the home grounds; the care of lawns; and the treatment of plants affected by insect and fungous pests.
11. Determination of botanical specimens.
12. Participation in the periodical distribution of surplus plant material and seeds, in accordance with special announcements sent to members from time to time.
13. Membership privileges in other botanic gardens and museums outside of Greater New York, when visiting other cities, and on presentation of membership card in Brooklyn Botanic Garden.

OUT-OF-TOWN MEMBERSHIP PRIVILEGES *

In accordance with a cooperative arrangement with a number of other institutions and organizations, Brooklyn Botanic Garden members, when visiting other cities, may, on presentation of their Botanic Garden membership card at the office of the cooperating museum or organization, be accorded, without charge, the same privileges as are enjoyed by the members of that institution, including admission to exhibits and lectures, and invitation to social events, if any. This does not include being enrolled on the mailing list for publications, and does not include free admission to the Philadelphia and Boston spring Flower Shows.

In reciprocation, the members of the cooperating units, when visiting the Metropolitan district of Greater New York, will be accorded full membership privileges at the Brooklyn Botanic Garden.

The cooperating units, beginning as of September, 1934, are as follows:

Boston Society of Natural History.
Buffalo Museum of Natural History.
Field Museum of Natural History (Chicago).
Massachusetts Horticultural Society (Boston).
Missouri Botanical Garden (St. Louis).
Newark Museum (New Jersey).
Pennsylvania Horticultural Society (Philadelphia).

* Announced here for the first time.

GENERAL INFORMATION CONCERNING THE ACTIVITIES OF THE BROOKLYN BOTANIC GARDEN

The Brooklyn Botanic Garden, established in 1910, is a department of the Brooklyn Institute of Arts and Sciences. It is supported in part by municipal appropriations, and in part by private funds, including income from endowment, membership dues, special contributions, and tuitions. Its articulation with the City is through the Department of Parks.

By an Agreement with the City of New York, the functions of the Garden have been defined as two-fold: first, the advancement of botanical science through original research; and second, the dissemination of a knowledge of plants.

The first of these activities is carried on by director, curators, resident investigators, fellows, and others, who devote all or a part of their time to independent investigation. At present these investigations include studies in genetics, plant pathology, systematic botany, economic botany, and horticulture.

The dissemination of botanical knowledge is accomplished in the following ways:

I. By the teaching of classes—
   - (*a*) of adults who are interested in some phase of pure or applied botany, or of horticulture;
   - (*b*) of teachers of botany, biology, and nature study, who come for special courses on the subject matter or teaching methods of their subjects;
   - (*c*) of children who come voluntarily outside of school hours;
   - (*d*) of children who come with their teachers from public and private schools for special lessons on plant life and closely related subjects.

II. By lectures at schools, garden clubs, and elsewhere by staff members.

III. By broadcasting.

IV. By loan sets of lantern slides accompanied by lecture text, for use in the schools.

V. By the distribution to schools of study material for classes in botany, biology, and nature study.

VI. By public lectures and educational motion pictures at the Botanic Garden.

VII. By maintaining labelled collections of living plants, arranged systematically, ecologically, and otherwise on the grounds and in the Conservatories of the Garden.

VIII. By the herbarium, containing specimens of preserved plants from all parts of the world.

IX. By maintaining a reference library on plant life and related subjects, open free to the public daily (except Sundays and holidays).

X. By the following periodicals and publications issued by the Botanic Garden:

1. American Journal of Botany (Monthly, except August and September).
2. Ecology (Quarterly).
3. Genetics (Bimonthly).
4. Brooklyn Botanic Garden Record, including Annual Report and Guides. (Quarterly.)
5. Leaflets (Weekly or biweekly in Spring and Fall).
6. Contributions (Irregular).
7. Memoirs (Irregular).
8. Miscellaneous:

Syllabi of lectures.
Guide sheets for classes.
Announcement cards and circulars.
Bibliographies.
Miscellaneous books and booklets.

XI. By popular and technical articles in journals and the public press, including regular "News Releases" concerning Botanic Garden activities and events.

XII. By the maintenance of a Bureau of Public Information on all phases of plant life.

XIII. By providing docents to accompany members and others who wish to view the collections under guidance.

XIV. By the installation of botanical and horticultural exhibits at

the Garden, the International Flower Show, and elsewhere.

XV. By cooperating with City Departments (e.g., Department of Parks and Board of Health) and other agencies in the dissemination of botanical knowledge.

The Brooklyn Botanic Garden is also taking an active part in the nation-wide movement for Scenic Preservation and legislation for the conservation of our native American plants.

A brief summary and report of the public educational work of the Garden from 1910 to 1928, with some attempt to set forth the fundamental principles upon which it is based, was published in the Brooklyn Botanic Garden RECORD for July, 1929. This is now out of print, but may be found on file at most of the larger libraries of the country.

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Plantations, comprising Systematic Section, Local Flora Section, Japanese Garden, Rock Garden, Rose Garden, and various Horticultural Displays. Flower Days.

Conservatories, Herbarium, Library, Laboratory Building, Instructional Greenhouses, Children's Room, Children's Building, Children's Garden, Shakespeare Garden, Meridian Panel, Armillary Sphere, Labelled Boulders, Etc.

BROOKLYN BOTANIC GARDEN RECORD

VOL. XXIII OCTOBER, 1934 NO. 4

PROSPECTUS: 1934–35

I. COOPERATION WITH LOCAL SCHOOLS

The Brooklyn Botanic Garden aims to cooperate in every practicable way with the public and private schools of Greater New York in all matters pertaining to the study of plants and closely related subjects. The purpose of the Garden in this connection is to supplement and enrich the school work in the way of instruction, demonstration methods, study material, etc., which otherwise would not be available.

Geography classes, as well as classes in nature study and botany, find the collection of useful plants in the economic plant house, the Local Flora Section, and also the Japanese Garden, the Meridian Panel, the Armillary Sphere, and the Labelled Boulders, valuable adjuncts to their class work. Arrangements may be made by teachers of geography to have their classes study these collections under guidance. Illustrated lectures for geography classes may also be arranged for at the Garden.

To visiting college classes in geology and physiography the Botanic Garden offers interesting material for a study of glaciation. Notable features are a portion of the Harbor Hill terminal moraine (Boulder Hill), the morainal pond (the "Lake"), the labelled glacial boulders, and the Flatbush outwash plain. See Guide No. 7, "*The Story of our Boulders: Glacial Geology of the Brooklyn Botanic Garden.*" See also pages 239–241 for statements concerning the Labelled Glacial Boulders, the Meridian Panel, and the Armillary Sphere.

A. Talks at Elementary Schools.—The principals of public or private schools may arrange to have talks given at the schools

on various topics related to nature study, such as garden work with children, tree planting, the conservation of wild flowers, and Arbor Day. If an illustrated lecture is desired, the lantern and operator must be provided by the school, but slides will be furnished by the Botanic Garden. Address the *Curator of Elementary Instruction* for a list of talks and for appointments.

B. Talks at Secondary Schools and Colleges.—Informal talks on various subjects of an advanced botanical nature have been given for many years at Secondary Schools and Colleges by members of the staff. Arrangements for such talks should be made with the *Curator of Public Instruction.*

C. School Classes at the Garden.—(*a*) Public or private schools may arrange for classes, accompanied by their teachers, to come to the Botanic Garden for illustrated lectures either by the teacher or by a member of the Garden Staff.

(*b*) Notice of such a visit should be sent at least *one week* previous to the date on which a talk is desired. Blank forms are provided by the Garden for this purpose. These talks will be illustrated by lantern slides, and by the conservatory collection of useful plants from the tropics and subtropics. Fall and spring announcements of topics will be issued during 1934–35.

(*c*) The Garden equipment, including plant material, lecture rooms, lantern, and slides, is at the disposal of teachers who desire to instruct their own classes at the Garden. Arrangements must be made in advance so that such work will not conflict with other classes and lectures. For High School and College classes address the *Curator of Public Instruction.* For Junior High and Elementary School classes address the *Curator of Elementary Instruction.*

(*d*) The principal of any elementary or high school in Brooklyn may arrange also for a series of six lessons on plant culture to be given to a class during the fall or spring. A small fee is charged to cover the cost of the materials used. The plants raised become the property of the pupils. The lessons will be worked out for the most part in the greenhouse, and the class must be accompanied by its teacher. This is adapted for pupils above the third grade.

D. Seeds for School and Home Planting.—Penny packets of seeds are put up by the Botanic Garden for children's use. In

1934 more than 840,000 packets were distributed. In the early spring, lists of these seeds, order blanks for teachers and pupils, and other information may be secured on application to the *Curator of Elementary Instruction.*

E. Conferences.—Conferences may be arranged by teachers and principals for the discussion of problems in connection with gardening and nature study. Appointments must be made in advance. Address the *Curator of Elementary Instruction.*

F. Study and Loan Material.—To the extent of its facilities, the Botanic Garden will provide, on request, various plants and plant parts for study; also certain protozoa and sterilized nutrient agar. When containers are necessary, as in the case of agar, algae, and protozoa, they must be furnished by the school.

In the past, the Garden offered this service gratis, but both on account of the increasing demand and because of the decrease in appropriations, it has become necessary to make a small charge for the material supplied or loaned. This charge will be made only for material furnished to junior high schools, high schools, and colleges. As far as possible, material will continue to be supplied gratis to elementary schools in case one or more of their teachers are members of regular Botanic Garden classes. A Price List of the various materials furnished will be mailed on request.

Requests for material should be made by mail or telephone (Prospect 9–6173), at least a day in advance, to Miss Julia E. Best, School Service Assistant. Elementary school material should be called for at the Information Booth on the ground floor; high school and college material at Room 327.

Material Usually Available

1. Algae:
   - Pleurococcus
   - Spirogyra
   - Vaucheria
   - Desmids
   - Blue-green algae: Oscillatoria and others.
2. Fungi:
   - Forms of fungi and lichens.
   - Plus and minus strains of bread mold.

Smut of oats or wheat.
Black stem rust of wheat.

3. Liverworts: Conocephalum and Lunularia.
4. Moss plants: protonema, "felt," and capsules.
5. Ferns:
   Prothallia: for these a covered Petri dish or tin box should be sent.
   Fronds with spores.
6. Selaginella with sporophylls.
7. Elodea—to show movement of protoplasm.
8. Corn or sorghum stems, dried.
9. Twigs to show opposite and alternate arrangement of buds.
10. Simple and compound leaves.
11. Various seeds and fruits to illustrate methods of dispersal.
12. Material for the study of genetics:
    Pods of Jimson weed showing inheritance of smooth and spiny pods.
    Sorghum seeds for demonstrating inheritance of red seedling color.
    Pea seeds to show Mendelian seed and seedling characters.
13. Sensitive plants (*Mimosa pudica*).
14. Protozoa: Paramoecium, Euglena, and others.
15. Fruit flies (*Drosophila*), wild type and mutants, transferred to bottles of culture medium supplied by applicant.

Specimens Loaned for Exhibit.

16. Leguminous roots with tubercles.
17. Riker mounts of powdery mildew, rusts and smuts, maple tar spot.
18. Riker mounts of peas showing inheritance of seed characters.
19. Oats showing inheritance of hull color.
20. Corn showing inheritance of endosperm colors.
21. Sorghum varieties and the F_1 hybrid.
22. Types of cereals: wheat, oats, barley, rye, rice, corn.
23. Eight types of wheat.
24. Eight types of barley.
25. Riker mounts of types of modified leaves.

26. Geranium, Coleus, Tradescantia—variegated green and white, for photosynthesis experiment.

Sterilized Agar

27. Petri dishes sent in *clean and dry* ten days in advance, or test tubes or flasks sent in one week in advance, will be filled with sterilized nutrient agar for the study of bacteria and molds.

G. Demonstration Experiments.—Teachers may arrange to have various physiological experiments or demonstrations conducted at the Garden for the benefit of their classes. Communications in regard to these matters should be addressed to the *Curator of Public Instruction.*

H. Loan Sets of Lantern Slides.—Sets of lantern slides have been prepared for loan to the schools. Each set is accompanied by a short lecture text of explanatory nature. In all cases these sets must be called for by a responsible school messenger and returned promptly in good condition. Address, by mail or telephone, Mr. Frank Stoll. The subjects now available are as follows. Other sets are in preparation.

1. Plant Life
2. Spring Wild Flowers
3. Common Trees
4. Fall Wild Flowers
5. Forestry
6. Conservation of Native Plants

II. BUREAU OF PUBLIC INFORMATION

Consultation and advice, and the facilities of the library and herbarium are freely at the service of members * of the Botanic Garden and (to a limited extent) of others with special problems relating to plants or plant products, especially in the following subjects:

1. Plant diseases and determination of fungi.
2. Plant geography and ecology.
3. Determination (naming) of flowering plants.
4. The growing of cultivated plants and their arrangement; also their adaptation to soils, climate, and other factors.
5. The care of trees, shrubs, and lawns, and general gardening problems.

* For information as to membership consult pages v–vii of this PROSPECTUS.

Inquiries should be directed to the *Curator of Public Instruction*, preferably by letter.

Determination of Specimens.—If the identification of plants is desired, the material submitted should include flowers, and fruit when obtainable. Identification of a single leaf is often impossible. For identification of plant diseases, representative portions of the part diseased should be sent.

III. DOCENTRY

To assist members and others in studying the collections the services of a docent may be obtained. Arrangements should be made by application to the *Curator of Public Instruction* one week in advance. No parties of less than six adults will be conducted. This service is free of charge to members; to others there is a charge of 50 cents per person. For information concerning membership in the Botanic Garden see pages v–vii of this PROSPECTUS.

IV. COURSES OF INSTRUCTION

Except courses A23 and A29, each of the courses here announced is a unit and not a series of unrelated lectures. Students must enroll for an *entire course*. With the exceptions noted, no registrations will be made for separate class exercises.

Courses of instruction are offered in Botany, Horticulture, and Nature Study, and are divided into four classes:

A. For members and the general public ("A" courses, p. 217)
B. For teachers ("B" courses, p. 221)
C. For children ("C" courses, p. 225)
D. Other courses of a special nature ("D" courses, p. 227)
E. Research courses ("E" courses, p. 227)

No course will be given when less than ten persons apply for registration. Since registration in many of the courses is restricted to a fixed number on account of the limited space available in the greenhouses, and for other reasons, those desiring to attend are urged to send in their application for enrollment and the entrance fee to the Secretary, Brooklyn Botanic Garden, several days in advance of the first exercise. This avoids delay at the beginning of the first exercise, ensures a place in the course, and enables the instructor to provide adequate material for the class.

Persons are requested not to register in any course, unless they are reasonably confident that they can attend the sessions of the class regularly and throughout. This is specially important where the number to be enrolled is limited. To register and not attend will quite certainly deprive someone else of the privilege of attending.

The following equipment is available for the courses:

1. Three *Classrooms* (in addition to the Boys' and Girls' Club Room in the Laboratory Building), equipped with stereoscopes and views, a stereopticon, plant collections, economic exhibits, models, and other apparatus and materials for instruction.

2. Two *Laboratory Rooms,* with the usual equipment for plant study.

3. Three *Instructional Greenhouses,* for the use of juvenile as well as adult classes, for instruction in plant propagation and related subjects.

4. *The Children's Garden,* on a piece of land about three-quarters of an acre in extent, in the southeast part of the Botanic Garden, divided into about 150 plots which are used throughout the season for practical individual instruction in gardening.

5. *The Children's Building,* near the north end of this plot, containing rooms for conferences and for the storage of tools, seeds, notebooks, special collections, etc.

6. *The Auditorium,* on the ground floor, capable of seating 570 persons, and equipped with a motion-picture machine and stereopticon, and electric current, gas, and running water for experiments connected with lectures.

In addition to these accommodations, the dried plant specimens in the herbarium, the living plants in the conservatories and plantations, and the various types of gardens, are readily accessible; while the main library and children's library, which contain a comprehensive collection of books on every phase of gardening and plant life, may be consulted freely at any time. See also pages 232–241.

A. Courses for Members and the General Public

Although the following courses are designed especially for Members of the Botanic Garden, they are open (unless otherwise specified) to any one who has a general interest in plants. Teach-

ers are welcome. Starred courses (*) are open also for credit to students of Long Island University, and are described in the current Long Island University catalog. Unless otherwise specified, all "A" courses are *free to members:* † of others a fee is required, as indicated. In courses where plants are raised, these become the property of the class members.

A13. Flowering Plants and Ferns of the New York Region: Fall Course.—Four sessions. Field identification of the common native and introduced plants of woodlands and roadsides, including identification of seeds and fruits. *Fee $2. Saturdays,* 2:30 p.m., *September 29 to October 27. (Omitting October 13.)*

Miss Rusk.

***A33. Plant Families: Fall Course.**—Ten outdoor sessions in the Botanic Garden, for a study of the principal groups of plants and their relation to animals. Fall flowers and fruits, the main steps of plant evolution, and the interdependence of plant and animal evolution are considered. *(Not offered in 1934.)*

Dr. Gundersen.

***A5. Trees and Shrubs of Greater New York: Fall Course.**—Ten outdoor lessons in the parks and woodlands of Greater New York on the characteristics of our common trees and shrubs, both native and cultivated, emphasizing their distinguishing features in the winter condition. *Fee, $5. Saturdays,* 2:30 p.m., *September 29 to December 15. (Omitting October 13 and December 1.)* The first session will be held at the Brooklyn Botanic Garden.

Dr. Graves and Miss Vilkomerson.

***A31. Ornamental Shrubs: Fall Course.**—Ten sessions, about eight of which are held outdoors in the Brooklyn Botanic Garden, for the purpose of becoming acquainted with the common species and varieties of cultivated shrubs. Fall flowers and fruits of ornamental shrubs and small trees, also evergreen shrubs, are studied. This is a continuation of the spring course. *Each division limited to 25 members, enrolled in order of application. Fee, $5. Wednesdays: Division I,* 10:30–11:45 a.m.; *Division II,* 4:15–5:30 p.m., *October 3 to December 12. (Omitting November 28).*

Dr. Gundersen.

* Accepted for credit in Long Island University.

† For information concerning membership in the Brooklyn Botanic Garden consult pages v–vii.

A1. Plants in the Home: How to Grow Them.—Five talks with demonstrations. This course deals with the principles to be followed in raising plants. Practice in potting, mixing soils, making cuttings, etc. The members of the class have the privilege of keeping the plants they have raised. *On account of restricted space in the greenhouse, this class must be limited to 40. Registration according to the order of application. Fee to non-members, $6 (including laboratory fee); to members, $1 laboratory fee. Wednesdays,* 11 a.m., *November 7 to December 12. (Omitting November 28.)* Mr. Free.

A20. Advanced Course in Gardening.—Ten lessons. This course presupposes a knowledge of the elements of gardening equivalent to that contained in courses **A1** and **A25.** It consists of lectures illustrated with lantern slides and living material, and includes frequent tours in the Brooklyn Botanic Garden where the various types of gardens and other subjects of the lectures are demonstrated. (*Not offered in 1934.*) Mr. Free and Dr. Reed.

A23. Flower Arrangement.—Sponsored by the Woman's Auxiliary. Five talks, with demonstrations, on the principles of effective flower arrangement. The topics will include the principles of design applied to the arrangement of flowers; types and periods of flower arrangement; the use of color; the Japanese principles of flower arrangement, with application to Western uses; discussion and judging of individual arrangements submitted by members of the class. The guest speakers are prominent authorities on the subjects of design and artistic flower arrangement. *Fee to non-members, $6. Single lectures, $1.25. Tuesdays,* 11 a.m. *January 8 to February 5.*

A29. Practical Gardening.—A Saturday afternoon course for men and women. Five talks with demonstrations. Subjects discussed are: Soil management; planting; pruning; combatting plant pests; plant propagation, including budding and grafting. At the close of each session the class will be afforded an opportunity to bring up special garden problems for discussion. *Fee, $4; single lecture, $1. Saturdays,* 3 p.m., *February 2 to March 9. (Omitting February 23.)* Mr. Free.

A34. The History of Plant and Animal Classification.—A discussion of man's changing concepts regarding the grouping and

relationships of living things. Three illustrated lectures, dealing chiefly with the higher plants and animals (seed-bearing plants and vertebrate animals).

1. The Ancients and the Middle Ages: Economic and Miscellaneous Classifications.
2. From the Discovery of America to the French Revolution: the Idea of Organic Affinity.
3. From the Nineteenth Century to the Present: the Idea of Evolution, and the Growth of its Influence on Plant and Animal Classification.

Fee, $2. Thursdays, 4 p.m., *March 7 to March 21.*

Dr. Gundersen.

A25. Fundamentals of Gardening.—A course in first principles, for those who desire to carry on practical work in their own gardens and to start seedlings in the greenhouse. The lessons are as follows:

Making cuttings of plants for use in the outdoor garden.
Planting seed in the greenhouse.
Planning the garden.
Pricking out seedlings in the greenhouse.
The garden soil.
Outdoor lesson.

Class limited to 60 members. Fee to non-members, $7 (including laboratory fee); to members, $2 laboratory fee. Wednesdays, 11 a.m., *March 27 to May 1.* Miss Shaw and Miss Dorward.

A35. Greenhouse Gardening.—A course for those who have taken Fundamentals of Gardening, and who desire to work in the greenhouse with the newer varieties of perennials and other materials. The lessons are as follows:

Making cuttings of bedding and perennial plants.
Planting of seed (choice seed of 1934–35 novelties).
Planting seed of rock garden material.
Pricking out seedlings.
Pricking out rock garden seedlings.

Class limited to 40 members. Fee to non-members, $10; to members, $5 laboratory fee. Tuesdays, 10:30 a.m., *April 9 to May 7.*

Miss Shaw, Mr. Free, and Miss Dorward.

(Mr. Free will conduct the lesson on the starting of rock garden plants from seed.)

***A32. Plant Families: Spring Course.**—Ten outdoor sessions in the Brooklyn Botanic Garden. This course treats of the structure and possible lines of evolution of flowers, and the characteristics of important families of flowering plants, such as the Magnolia, Buttercup, Rose, Pea, Mustard, Pink, Geranium, Mallow, Carrot, Heath, Potato, Figwort, Mint, Honeysuckle, Composite, and Lily Families. Two divisions. *Each division limited to 25 members, enrolled in the order of application. Fee, $5. Wednesdays: Division I,* 10:30–11:45 a.m.; *Division II,* 4:15–5:30 p.m., *April 10 to June 12.* Dr. Gundersen.

***A30. Ornamental Shrubs: Spring Course.**—Ten outdoor sessions held on the grounds of the Brooklyn Botanic Garden, dealing with the shrubs used in ornamental planting. More than two hundred species and varieties of shrubs are studied at the time of flowering. (*Not offered in 1935.*) Dr. Gundersen.

***A9. Trees and Shrubs of Greater New York: Spring Course.**—Ten outdoor lessons in the parks and woodlands of Greater New York, the principal object being to gain a ready acquaintance with the common trees and shrubs of the eastern United States, which are well represented in this region. The species are considered in systematic order, and the features emphasized by which they may most easily be recognized. *Fee, $5. Saturdays,* 2:30 p.m., *April 13 to June 15.* (*Omitting April 20.*) Dr. Graves and Miss Vilkomerson.

A11. Flowering Plants and Ferns of the New York Region: Spring Course.—Six sessions, in the Brooklyn Botanic Garden and in the woodlands near the City, for field identification of spring flowers and ferns. *Fee, $3. Saturdays,* 2:30 p.m., *April 27 to June 1.* Miss Rusk.

B. Courses for Teachers: Given in Cooperation with the Brooklyn Teachers Association

These courses have been accepted by the Brooklyn Teachers Association, and appear in its Syllabus of Courses. On satisfactory completion of each course, the student is awarded a certificate by the Brooklyn Teachers Association, in cooperation with the Brooklyn Botanic Garden. The courses are also accepted by the New York Board of Education for credit toward higher teaching li-

censes, one credit being granted for each 15 hours (with the exception of "B8, Plant Culture"). Through an agreement made in January, 1931, with Long Island University, undergraduate credit for certain courses will be allowed toward fulfilling the requirements for a university degree, provided the admission requirements at the University and the laboratory requirements have been fulfilled. Such courses are starred. By arrangement with the institution concerned, these credits may also be used as undergraduate credits in other colleges and universities. Nature materials used in the courses, and plants raised become the property of the student.

Members of the Garden are entitled to a 50 per cent. discount from the regular fee for all "B" courses; from other persons the indicated fee is required. Long Island University students desirous of electing any of these or of the "A" courses should notify Dean Tristram W. Metcalfe or Dr. Ralph H. Cheney, who will give the candidate a card entitling him to admission to the course. The student should present this card at the beginning of the first session of the course. *No course will be given when less than ten persons apply.*

***B1. General Botany.**—A two-year course of thirty class meetings each year. Also thirty two-hour laboratory periods, the time for the latter to be arranged when the class is organized. The first year (A) is spent on the structure and functions of the higher plants. Four credits. The second year (B) deals with the lower groups, their structure, life histories, and relationships. Four credits. In 1934–35 the first half of the course (A) will be given. The first half is not a prerequisite for the second, but those who have never studied botany before are advised to take (A) first. *Fee, $10 each year. Thursdays,* 4 p.m., beginning *September 27.* Miss Rusk.

***B10. Flowering Plants: Field and Laboratory Study.**—Thirty sessions. The object of this course is to become acquainted with the species of wild flowering plants (native plants and introduced weeds), and to learn how to identify them. Field and laboratory work are distributed according to the weather, the season, and the needs of the class. The field work is done largely in the Brooklyn Botanic Garden. The laboratory work consists of ex-

* Accepted for credit in Long Island University.

amining flowering plants and identifying them by means of a key. Prerequisite: an elementary course in botany. Two credits. *Fee, $10. Wednesdays,* 4 p.m., beginning *September 26.* Miss Rusk.

***B11–12. Structural Botany of the Higher Plants.**—Thirty three-hour sessions (one lecture, one two-hour laboratory period). This course is designed to employ the special facilities of the Brooklyn Botanic Garden. It deals chiefly with gross morphology and variation of leaves, stems, and fruits, and a systematic study of the flowering plants. It utilizes the living material in the conservatories. Of special importance is a written report, comprising an investigation of living plants and a study of references in the library. The topic for this report will be selected from the following:

1. Development of perforated leaves in *Monstera.*
2. Vivipary in ferns and flowering plants.
3. Comparison of the succulent plants of South Africa and America.
4. Comparison of flowers in various species and hybrids of *Citrus.*
5. A comparison of structure in several species of orchids.
6. A study of cladophylls and phyllocladia.
7. A study of the leaves and stinging hairs of *Laportea moroides.*
8. Growth and fruit production in the banana.
9. Variation in shape and coloring in leaves of croton (*Codiaeum*).
10. Types of pollen in greenhouse plants.
11. Morphological variation in spines and prickles.
12. Structure of a species of greenhouse plant.
13. Structure of insectivorous plants.

Four credits. *Prerequisite,* General Botany (**B1**) or its equivalent. *Fee, $10. Saturdays,* 9 to 12 a.m., beginning *September 29.* Dr. Svenson and Miss Rusk.

***B13–14. Trees and Shrubs of Greater New York.**—Twenty two-hour sessions. A course of outdoor lessons in the parks and woodlands of Greater New York, the principal object being to gain a ready acquaintance with the common trees and shrubs of the eastern United States, which are well represented in this region.

The species are considered in systematic order, in both winter and summer conditions, and the features pointed out by which they may most easily be recognized. Two credits. *Fee, $10. Saturdays,* 2:30 p.m., *September 29 to December 15;* and *April 13 to June 15. (Omitting October 13, December 1, and April 20.)*

Dr. Graves and Miss Vilkomerson.

***B15–16. Economic Plants.**—Thirty sessions. The most important economic plants of the world are considered—their history, culture, formation of their useful products, and the extraction and preparation of the latter by man. Herbarium specimens and other material, as well as living plants in the conservatories and plantations of the Garden will be used for demonstrations. Because of its practical applications, this course will be of especial value to teachers. Two credits. *Fee, $10. Mondays,* 4 p.m., beginning *October 8.*

Dr. Cheney.

B2. Nature Study.—A thirty hour course in two-hour sessions. Seven sessions in the fall; eight sessions in the spring. *For teachers only.* A concentrated course in alertness for Nature Curators,† designed to be of specific help in planning school nature lessons, supplying material, and preparing and exhibiting plant specimens. Two credits. *Class limited to 40 members. Fee, $10. Tuesdays and Thursdays,* 4 p.m., fall term beginning *October 2;* spring term beginning *April 25, 1935.*

Miss Miner and Miss Dorward.

N.B.—Any student in this class desirous of finishing thirty hours during the fall may have, beginning Tuesday, October 30, one two-hour period a week on Nature Projects for Classrooms with Miss Shaw as instructor. (See Educational Principles of Children's Gardening and Nature Study, B4, for extra hours supplementing spring session.)

B3. Principles of Horticulture.—Thirty sessions. *For teachers only.* Open to beginners and to former members of

† In each Public School of New York City one teacher is selected as the garden teacher to be held responsible for the school garden in that school. "The special duty of the Nature Curators will be to assist the principal as he shall direct in using for nature study any or all of the nature contacts that may be available in his school. . . . Credit for salary increment, equivalent for one year, will be given to all nature curators who complete an approved thirty hour course in natural science or related subjects."

Principles of Agriculture and Horticulture (formerly B3; now discontinued). Lessons in potting and general care of house plants; methods of plant propagation, including the planting of bulbs; making cuttings (soft wood, hard wood, and leaf); sowing seeds; insect pests; plant diseases; making dish gardens; preparing for the outdoor garden. Most of this work is carried on in the greenhouses. Emphasis will be laid on problems of a practical nature. Two credits. *Fee, $10. Wednesdays,* 4 p.m., beginning *September 26.* Miss Shaw and Miss Dorward.

B4. Educational Principles of Children's Gardening and Nature Study.—Eight two-hour sessions. No credit allowed except for members of B2, Nature Study Course. *Fee, $5,* except to students of B2, Nature Study. *Tuesdays,* 4 p.m., beginning *January 29, 1935.* Miss Shaw.

B5. Children's Garden Practice.—(*Not offered in 1934–35.*) Miss Shaw.

B7. Greenhouse Work.—(*Included under B3 for 1934–35.*) Miss Dorward.

B8. Plant Culture.—Twenty sessions. Any student who has taken *Principles of Agriculture and Horticulture* (formerly B3; now discontinued) and Greenhouse Work, and is desirous of a place in the greenhouse for independent work with a monthly conference, should apply for this privilege on October 4. No credit. *Fee, $10. Thursdays,* 4 p.m., beginning *October 18.* Miss Shaw.

C. Children's Courses

The following courses are open to all boys and girls between the ages of eight and eighteen. Enrollment in these courses entitles the boy or girl to membership in the Boys' and Girls' Club of the Brooklyn Botanic Garden. Papers by members of the Club, on various botanical and horticultural subjects, are read at the meetings, and the speakers are then entitled to silver pins, providing they have satisfactorily completed work for their bronze medals and have received them. For information concerning the Children's Room, the Children's Building, and the Children's Garden, see pages 238–239.

C1. Fall Greenhouse Work.—The following courses are given for boys and girls interested in greenhouse work and botani-

cal nature study. *The fee is ten cents.* Miss Shaw and Assistants.

Class A.—Open to boys and girls from eight to twelve years old. *Saturday* mornings at 9:15. *October 20 to December 22.*

Class B.—Open to boys and girls twelve years of age and over. *Saturday* mornings at 10:00. *October 20 to December 22.*

C2. Special Activities.—Special work as applied to greenhouse and garden activities. Members for this class will be selected from honor students in the fall courses. Work is open only to boys and girls fourteen years old and over. *No fee.* Given in January and February, 1935. Miss Shaw and Miss Dorward.

C3. Preparation for the Outdoor Garden.—The following classes are open to boys and girls during the spring of each year. The courses are planned for a better understanding of plant life and so that the outdoor garden may become a more intelligent piece of work. *On account of limited space in the Children's Greenhouse, classes are limited to twenty. The fee for each is ten cents to cover the cost of material.* Miss Shaw and Assistants.

Class A.—Open to boys and girls from eight to twelve years old. *Saturday* mornings at 9:15. *March 2 to April 27.*

Class B.—Open to boys and girls twelve years of age and over. *Saturday* mornings at 10:00. *March 2 to April 27.*

C4. Advanced Work for Older Boys and Girls.—How to raise plants, mix soils, transplant, start seedlings for outdoor gardens, etc. Boys and girls who have taken spring courses under C5 are eligible for advanced work. *The fee for the course is twenty-five cents.* Each student may take home his plants and seedlings. This course is open to both boys and girls over twelve years of age. *Saturday* mornings at 9:30; *February, 1935.*

Miss Dorward.

C5. The Beginners' Outdoor Garden.—Open annually to 150 boys and girls who carry on their projects in gardening on plots 8 ft. by 10 ft. No person is eligible for a garden who has not been a member of spring classes. *Fee, twenty-five cents.* *Saturday* mornings, 9–12, *May 11 to October 5.*

Miss Shaw and Assistants.

C6. The Advanced Outdoor Garden.—Open to 75 boys and girls who have had several seasons in the Beginners' Garden (C5).

All candidates must have been in spring classes. *Fee, fifty cents. Saturday* mornings, 9–12, *May 11 to October 5.*

Miss Shaw and Assistants.

C7. Junior Garden Assistants.—Open to older boys and girls or to those who have mastered Courses C2 and C4. Size of plot 10 ft. by 15 ft. Registration date: *May 4. No fee.*

Miss Miner.

C9. Nature Study for Boy Scouts, Girl Scouts, Camp Fire Girls, Scout Leaders, and Others.—Short courses of at least four periods each, with talks, demonstrations, and field trips in the grounds of the Botanic Garden and Prospect Park to study trees, shrubs, etc. The instruction and schedule dates will be adapted to meet the needs of the various groups that apply. *Open only to groups of at least ten persons.* Hours to be arranged. *No fee.*

Dr. Graves, Miss Miner, and Assistants.

C10. Special Work for High School Pupils.—A course in gardening or greenhouse work for high school pupils. Classes to be arranged for by the high school teacher. *Fee for materials used.*

Miss Shaw and Assistants.

D. Course for Student Nurses

D1. General Botany With Special Reference to Medicinal Plants.—A course of 10 spring and 10 fall lectures, demonstrations, and field trips for student nurses. Arranged in cooperation with various hospitals. The general principles governing the life of plants, as well as the use and care of flowers and potted plants in the sick room, will be considered. Special attention will be paid to the identification of officinal plants in the field. Hours to be arranged. *No fee.*

Dr. Graves.

E. Investigation

1. *Graduate Work for University Credit*

By the terms of a cooperative agreement between New York University and the Brooklyn Botanic Garden, properly qualified graduate students may arrange to carry on independent investigations in botany at the Garden under the direction of members of the Garden Staff, who are also officers of instruction in the Grad-

uate School of the University. The advantages of the laboratory, herbarium, and collections of living plants at the Garden are freely at the disposal of students registered at New York University for such work. Such properly enrolled graduate students are charged no additional fees by the Garden. The following courses are approved by the faculty of the Graduate School of New York University and are given credit as full courses:

E6. Research in Mycology and Plant Pathology.—Investigation of problems relating to fungi and fungous diseases of plants. Dr. Reed.

E8. Research in Forest Pathology.—Investigation of the diseases of woody plants. Dr. Graves.

E9. Research in Systematic Botany of the Flowering Plants.—Investigation relating to the classification of the higher plants. Dr. Gundersen and Dr. Svenson.

2. *Independent Investigation*

The facilities of the laboratories, conservatories, library, and herbarium are available to qualified investigators who wish to carry on independent researches in their chosen field. There is a charge of $25 per year, payable to the Botanic Garden.

V

MISCELLANEOUS

Press Releases

In order to keep the public informed of events at the Garden, news items are sent at fairly regular and frequent intervals to the metropolitan dailies and to many of the suburban papers. These news releases consist of announcements of the periods when the principal floral displays are at their best, of the acquisition of new plants, the blossoming of rare species, improvements in the plantations, the installation of new collections and exhibits, the results of research and exploration, etc. The beginnings of the various public courses, as well as public lectures, meetings of various societies at the Garden, Flower Days, and social events are also announced through the public press.

Broadcasting

Radio broadcasting has now become an integral part of the educational program. During 1933 members of the Garden personnel gave 28 radio talks on general botanical or horticultural topics and concerning the Brooklyn Botanic Garden, as follows: Over WOR, 12; WNYC, 15; WINS, 1.

The talks over WOR were given in cooperation with the Cooperative Extension Work in Agriculture and Home Economics of the State of New Jersey. In connection with these talks a Radio Garden Club and a Junior Radio Garden Club have been organized. Bulletins are sent regularly to the members of these clubs, and a " fan " mail has developed as a bureau of information on horticultural topics.

Broadcasting, including the cooperation with the State of New Jersey, is being continued during 1934, and will be continued during 1935. Those interested should watch the daily paper announcements for talks on gardening and plant life.

Circulars of Information

Circulars descriptive of the various courses and lectures are distributed, without charge, according to a regular mailing list which includes Brooklyn Botanic Garden officials and members, members of The Woman's Auxiliary, all the libraries and schools of Greater New York, registered and former students, and others. Requests to be placed on this mailing list should be addressed to the *Curator of Public Instruction.*

Popular Publications

Leaflets.—The publication of the Brooklyn Botanic Garden *Leaflets* commenced in 1913. Approximately ten numbers—sometimes more—constitute a Series, one series being issued each year. The current series is Number XXII. At the end of every four years, for convenience in binding, a table of contents of the *Leaflets* published during the four year period is issued.

The purpose of the *Leaflets* is primarily to present popular information about plant life in general for teachers and others, and to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue. The

Leaflets are free to members of the Garden and (on request) to teachers in the schools of Greater New York. For others, the subscription is 50 cents per year, or 5 cents a number (4 pages); double or triple numbers (8 or 12 pages) at the same rate.

Besides the *Leaflets,* numerous popular articles on various phases of plant life and gardening are written by members of the staff for publication in periodicals and newspapers.

The Plant World.—By C. Stuart Gager. A popular introduction to the more interesting facts concerning the plant life of the earth, and the importance of plants in our daily lives. 136 pages; 79 illustrations. Price 75 cents. On sale at the Information Desk and Entrance Gates, and by mail.

A Teaching Guide to the Trees and Shrubs of Greater New York.—By Arthur H. Graves and Hester M. Rusk. A handbook used in Botanic Garden classes, of brief, non-technical descriptions of the woody plants of the Greater New York region, with the characters by which they may be recognized in summer or winter. Keys, a glossary, and index are appended. ix + 76 pages. Price 75 cents. On sale at the Information Desk and Entrance Gates, and by mail.

Illustrations of Flowering Plants of the Middle Atlantic and New England States.—By the late George T. Stevens, M.D. Edited by Alfred Gundersen. Contains 199 plates and index of about 1500 species of the commoner flowering plants, exclusive of the grasses and sedges. Reprinted primarily for use in Brooklyn Botanic Garden classes. Price $1.00. On sale at the Information Desk and Entrance Gates, and by mail.

Guide Books, Maps, and Souvenir Postcards of the Garden

During the last few years, Guide Books have been published from time to time, as special numbers of the *Brooklyn Botanic Garden Record,* based upon and explaining various Botanic Garden features and exhibits.

Each of these publications is more than a guide to an exhibit; it is an elementary treatise on the general subject illustrated by the Garden feature or exhibit. In this way the Guides have value even for those who may not be able to visit the Botanic Garden. The following numbers have been published:

Guide No. 2. Gardens within a garden: A general guide to the grounds of the Brooklyn Botanic Garden. By C. Stuart Gager. May, 1929. 36 pages, 16 illustrations and map. Price, 25 cents. Out of print.

Guide No. 3. The story of our metate: A chronicle of corn. By F. W. Hodge. November, 1929. 25 pages, 14 illustrations. Price, 25 cents.

Guide No. 4. The Japanese Garden of the Brooklyn Botanic Garden. By Bunkio Matsuki. July, 1930. 38 pages, 20 illustrations. Price, 35 cents; by mail, 40 cents. Out of print.

Guide No. 5. The Rock Garden of the Brooklyn Botanic Garden. By Montague Free. May, 1931. 55 pages, 28 illustrations. Price, 35 cents; by mail, 40 cents.

Guide No. 6. Japanese potted trees (Hachinoki). By Bunkio Matsuki. November, 1931. 16 pages, 11 illustrations. Price, 35 cents; by mail, 40 cents.

Guide No. 7. The story of our boulders: Glacial geology of the Brooklyn Botanic Garden. By C. Stuart Gager and Ernst Antevs. May, 1932. 43 pages, 22 illustrations. Price, 35 cents; by mails, 40 cents.

Guide No. 8. The story of fossil plants. Guide to the eight transparencies in Conservatory House No. 2. By Edward W. Berry. July, 1932. 29 pages, 8 illustrations. Price, 35 cents; by mail, 40 cents.

These Guides are mailed free, as published, to members of the Garden. Similar guides are in preparation and will be published from time to time.

A detailed map of the Garden, showing not only the various types of gardens included in the Botanic Garden area, but especially the location of the various orders and families in the Systematic Section, is appended to the General Guide. Copies are on sale at 5 cents each.

A colored picture map of the Garden, 7½ x 3½ feet, designed and executed by Miss Helen Sewall, is on view in the Laboratory Building. This map was presented to the Garden at the Annual Spring Inspection, May 14, 1929, as a memorial to the late Dr. Glentworth R. Butler by members of the Woman's Auxiliary and other friends of Dr. Butler. Photographs of this map (in black and white, 6½ x 4¼ inches) may be had at 20 cents each.

Souvenir postcards, in colors, may be had at 10 cents at set (7 cards); three for 5 cents; 2 cents each. The subjects are: Scene in the Children's Garden; The Brook; Daffodils in the Lawn; The Lake; Children's Building and Formal Garden; The Rock Garden (Waterfall and Iris); The Japanese Garden (Wisteria); Inflorescence of Sago Palm.

Orders for guide books, maps, and souvenir postcards, accompanied by remittance, should be sent to *The Secretary*. These articles may also be obtained at the Information Desk in the Laboratory Building, and at the Entrance Gates.

VI

OTHER EDUCATIONAL FEATURES

Plantations

The plantations comprise the following sections:

1. General Systematic Section (trees, shrubs, and herbaceous plants arranged according to orders and families).
2. Local Flora Section (Native wild flower garden). Arrangement ecological.
3. Ecologic Garden.
4. Japanese Garden.
5. Rock Garden.
6. Rose Garden.
7. Iris Garden.
8. Water Gardens (Lake, Brook, Swamp, Bog, Pools).
9. Children's Garden.
10. Shakespeare Garden.
11. Horticultural Garden.
12. Conservatory Plaza (Water Lilies, Herbaceous Borders).
13. Laboratory Plaza (Magnolias).
14. Experimental Garden (Test Garden for beardless Iris; Plant Pathology and Plant Breeding Plots).
15. Nursery.

As noted under *Docentry* (p. 216) arrangements may be made for viewing the plantations under guidance. They are open free to the public daily from 8 a.m. until dusk; on Sundays and holidays from 10 a.m. until dusk.

Systematic Section

The main part of the outdoor plantations is devoted to the Systematic Section, which extends from north to south through the central part of the Garden. Here the plants are grouped according to their botanical relationships, in orders, families, and genera, following approximately the Engler system of plant classification. From the simpler and more primitive types of plants at the north end, to the more highly developed groups at the south, the Systematic Section comprises representative members of the families of plants which are hardy or semi-hardy in this climate. In accordance with this arrangement, the ferns and the conifers and other gymnosperms are at the northern end. Then follow the trees, shrubs, and herbaceous plants of the various families of dicotyledons. Along the east side of the Brook are the polypetalae. Along the west side of the Brook are the monocotyledons, and the sympetalae. The catkin-bearing trees and shrubs follow the line of the Brook. Wherever possible, the plants chosen to represent their groups are those which are of interest from both botanical and horticultural points of view.

Local Flora Section

This is an area of about two acres devoted to plants native within approximately 100 miles of Brooklyn (the Torrey Botanical Club range). The following ecological units are represented: bog, sand barren, pond, meadow, and woodland. Nearly all the native plants of general interest are well established here, with the exception of the limestone (calciphile) ferns, for which there is as yet no suitable place. Although the section is not yet open to the general public, arrangements may be made with the *Curator of Public Instruction* for its inspection by botany classes, to whose needs this area is especially adapted.

Japanese Garden

The Japanese Garden, first opened to the public in 1915, was a gift to the Botanic Garden from Mr. Alfred T. White, "the father of the Botanic Garden." The design, by the Japanese landscape architect, Mr. Takeo Shiota, carries out faithfully the Japanese

idea of a *Niwa,* or landscape garden. From the tea house (near the east entrance) one can see the *machiai* or "rest house," the island with the drum bridge, bronze storks, stone and wooden lanterns, the waterfalls, and the wooden Torii standing in the lake, recalling the one at Miyajima, Japan. Since January 1, 1919, the Garden has been in charge of Miss Mary Averill, honorary curator of Japanese gardening and floral art, and has been steadily improved, under her supervision, by Japanese gardeners. For details and explanations of the meaning of the various features see "The Japanese Garden of the Brooklyn Botanic Garden": Guide No. 4. (*Brooklyn Botanic Garden Record* **19**: 197–234. July, 1930.)

Rock Garden

The Rock Garden, constructed in the spring of 1916, is, in point of time, perhaps, the first rock garden of any considerable size in a public garden or park in the United States. The rocks used in its construction are glacial boulders which were uncovered in the course of grading operations on other parts of the grounds; they are the only "native" rocks on Long Island, with the exception of one small outcrop on the northwest shore. The general idea in making the garden was that of representing a boulder-strewn slope, but this design, of necessity, was modified in places to provide proper cultural conditions as to drainage, depth of soil, and shade. The garden is planted with about eight hundred species and varieties of alpine, saxatile, and other plants suitable for rock garden culture.

Although the rock garden enthusiast may expect to find something of interest in bloom during every month of the year, it is in April, May, and June that the Rock Garden provides its greatest display of blossoms. Persons interested in rock gardening will find Guide No. 5, *The Rock Garden of the Brooklyn Botanic Garden,* helpful; also, *Leaflets,* series XI, No. 6, *The Rock Garden.*

Rose Garden

The Rose Garden, occupying about one acre in the northwest part of the Botanic Garden, was formally opened to the public

on Sunday afternoon, June 24, 1928. This garden was made possible by a gift of $10,000, later increased to $15,000, from Mr. and Mrs. Walter V. Cranford, of Greenwich, Connecticut.

The general plan of the Garden is as follows. At the north end, entrance is gained through a Doric pergola. Three parallel rows of beds extend to the southward from the pergola, as far as the pavilion. In the central row of beds, varieties of hybrid perpetuals have been planted along with many of the small polyantha type; each of the two side rows contains varieties of hybrid teas. In the arrangement of these varieties the older forms appear at the beginning, near the pergola, the most recent productions near the pavilion, with the intermediate forms in chronological sequence between. Varieties of pillar and post roses are planted at regular intervals, on suitable supports, in the beds, with standards between the beds of the side rows. The trellis surrounding the garden, and also the pergola and pavilion, furnish support for climbing roses, while the marginal beds along the trellis are for wild species and their derivatives. South of the pavilion, three additional beds are devoted to historical roses, *i.e.*, those mentioned in ancient literature, and to roses of commercial use.

The Rose Garden is open to the public from 9 a.m. to 5 p.m. on weekdays (except holidays) during the rose season, and from 9 a.m. to 7 p.m. in June. Children are admitted only when accompanied by responsible adults.

Flower Days

In order to afford members of the Garden and friends whom they may invite, an opportunity to see, under expert guidance, some of the most conspicuous and interesting floral displays of the Garden; to assist them toward solving some of their own gardening problems; and to enable them to meet for discussion, a series of special days, called Flower Days, was inaugurated in 1927. The dates selected are those in which the particular flowers furnishing the theme for discussion are in their prime. Up to and including 1934 the following "Days" have been observed:

Crocus Day
Daffodil Day
Tulip Day
Rock Garden Day
Japanese Garden Day
Iris Day
Rose Garden Day (June)
Japanese Iris Day
Water Garden Day
Fall Rose Garden Day
Canna Day
Chrysanthemum Day

On each of these occasions a specialist gives an illustrated talk on the flower of the Day, followed by a tour of inspection of the flowers in bloom on the grounds of the Garden. The speakers are either members of the Garden staff who have made a special study of the flowers in question, or invited experts in their breeding or growing. During the outdoor inspection, members may discuss with the leader questions of desirable varieties, culture, disease, etc. On the return to the Laboratory Building, tea is served. The exercises commence at 3:30 p.m.

These Flower Days, now an established feature of the Garden's activities, have come to be of more than local interest. In 1934 the Botanic Garden's "Rock Garden Day" was the occasion of the first annual meeting of the American Rock Garden Society. Similarly, in other years, the American Iris Society and the American Rose Society have held their meetings at the Garden and have joined with the Garden members in the celebration of their respective Flower Days.

Conservatories

The Garden conservatories contain a collection of tender and tropical plants. Of special interest for teachers of nature study and geography are the following useful plants from the tropics and subtropics: banana, orange, lemon, lime, kumquat, tamarind, West Indian cedar (the source of the wood used for cigar boxes), eucalyptus, Manila hemp, sisal, pandanus (source of the fiber used for making certain kinds of fiber hats), fig, grapevines from north and south Africa, date palm, coconut palm, chocolate tree, coffee, tea, ginger, bamboo, mahogany, balsa, cocaine plant, black pepper, annatto (used in coloring butter and cheese), cardamom, olive, pomegranate, logwood, durian, mango, sugar cane, avocado (so-called "alligator pear"), West Indian and other rubber plants, banyan, religious fig of India, and numerous others.

It may be of interest to teachers of botany that the nine extant genera of cycads are now represented in House 12. To reach the Cycad House take the first door to the *left* after entering the central or Economic House and pass through to the end house.

The Conservatories are open April 1 to October 31, 10 a.m.–4:30 p.m. (Sundays, 2–4:30); November 1 to March 31, 10 a.m.–4 p.m. (Sundays, 2–4).

Herbarium

The Garden herbarium consists at present of about 200,000 specimens, including phanerogams, ferns, mosses, liverworts, lichens, parasitic and other fungi, algae, and myxomycetes. This collection may be consulted daily (except Sundays and holidays) from 9 a.m. until 5 p.m., Saturdays from 9 a.m. to 12 m. Specimens submitted for identification will be gladly received.

Library

The rapidly growing library of the Garden comprises at present approximately 18,000 volumes and more than 14,000 pamphlets. This is not a circulating library, but is open free for consultation to all persons daily (except Sundays and holidays) from 9 a.m. until 5 p.m. (Saturdays, 9 to 12). Nearly 1,000 periodicals and serial publications devoted to botany and closely related subjects are regularly received. These include the transactions of scientific societies from all quarters of the globe; the bulletins, monographs, reports, and other publications of various departments of the United States Government, as well as those of foreign governments, and of all state agricultural experiment stations and agricultural colleges; the publications of research laboratories, universities, botanic gardens, and other scientific institutions of the world, as well as the files of independent journals devoted to the various phases of plant life. The library is specially rich in publications of foreign countries and has a growing collection of incunabula and other pre-Linnean works.

Bibliographical assistance is rendered to readers by members of the Library staff.

Laboratory Building

The Laboratory Building contains (besides offices of administration and the Library and Herbarium mentioned above) four laboratory rooms, a culture room, three classrooms with stereopticon and other equipment for instruction, a room for the installation of temporary exhibits, six private research rooms, and an auditorium seating about 570 and equipped with motion picture machine, stereopticon, and lecture table supplied with water, gas, and electric current for lectures involving experimental work.

Instructional Greenhouses

A range of three greenhouses, each about 20 x 30 feet, is provided for the practical instruction of children and adults in plant propagation and other subjects.

Children's Room

A gift of $1,500 in 1921 from Mrs. Helen Sherman Pratt, supplemented in 1923 by a further gift of $500 from Mr. George D. Pratt, has made it possible to provide a beautifully decorated room for the use of the Boys' and Girls' Club. Any boy or girl who is enrolled, or has been enrolled, in any of the children's classes at the Garden is eligible for membership in this club, which now numbers about 1,000 active members. The room contains shelves for a nature-study library, of which a nucleus has already been secured, and is equipped with stereoscopic views, photographs, and preserved and living specimens of plant life, for the instruction and entertainment of boys and girls. The room is open free to all children. Contributions of specimens and of books on nature study and closely related subjects will be most welcome.

Children's Building

This is located in the northern part of the Children's Garden plot and contains a conference room, and rooms for the storage of garden tools and implements. The furniture in the conference room was a gift from Mrs. James H. Post. Various collections of plants, seeds, and insects of economic importance in the garden

are accessible here for consultation by the children. A garden library, a gift of friends, has been added. North of the Children's Building is a plot planted to ornamental shrubs and herbaceous perennials for the instruction of the children.

Children's Garden

A plot of about three-quarters of an acre in the southeast part of the Botanic Garden is devoted to the theoretical and practical instruction of children in gardening. The larger part of this area is laid out in garden plots which will accommodate about 200 children. At the south end is a Shapespeare Garden, given by Mrs. Henry W. Folger.

Non-Botanical Educational Features

Meridian Panel.—In 1931 there was placed in the paved walk in front of the main west entrance to the Laboratory Building a Terrestrial Position Panel, briefly referred to as the "Meridian Panel." This panel, of black Belgian marble terrazzo, is 21 feet, 2 inches long, and 5 feet wide. It contains a brass strip, 20 feet long and 7/8 inch wide, laid along the geographical meridian, the location of which was accurately determined by Mr. Weld Arnold, then of the School of Surveying of the American Geographical Society, but now of the School of Geography, Harvard University.

Another brass strip, 18½ feet long and 5/8 inch wide, marking the magnetic meridian, crosses the geographical meridian at an angle of 11° 11′. The data at the ends of the meridians are as follows:

At the North End:

Magnetic north. Variation 11° 11′ west in 1931
Annual increase 4′

At the South End:

Altitude above mean sea level, 115 feet
North latitude, 40° 40′ 06″
Longitude west of Greenwich, 73° 57′ 48″
To the North Pole, 3416.7 miles
To the Equator, 2798.2 miles

This feature is proving of much public interest, and the data are constantly being copied by school classes and others.

Armillary Sphere.—The central feature of the Laboratory Plaza is the large Compass and Armillary Sphere erected in 1933. This was made possible through a bequest of the late Alfred W. Jenkins, a former member of the Botanic Garden Governing Committee. The Armillary Sphere consists of circular bands of bronze representing the principal celestial circles, and has been designed to serve also as a sun dial. Strictly, an armillary sphere should have either the earth or the sun represented in its center, but here, in order to make it serve as a sun dial, these are omitted, and a slender metal rod, extending from the south to the north pole of the sphere, serves as a gnomon. From the shadow thrown by this rod the correct sun time is indicated on a dial on the inner surface of the equatorial band. By means of the "Equation of Time" inside the sphere, this can be changed to Standard Time. The signs of the zodiac are to be seen on the outside of this broad band (as the band of the ecliptic where they are usually placed is too narrow to receive them): they were modelled by Miss Rhys Caparn, sculptor. The north pole points to the North Celestial Pole. The sphere is mounted on a pedestal of Carver black granite from Vinal Haven, Maine. A bronze band encircling the pedestal bears the following classic sun dial motto:

"Serene I stand amyddst ye flowres
To tell ye passing of ye howres."

The pedestal rests on an octagonal platform of Stony Creek (Connecticut) pink granite, and the whole is mounted at the center of a large circular compass paved with marble terrazzo in four colors, each color representing a different point of the compass. The marble chips used in the terrazzo are of various origins, the red marble coming from Massa, Italy, the black from Mazy, Belgium, the green from Cardiff, Maryland, and the yellow from Siena, Italy.

Labelled Boulders.—The Brooklyn Botanic Garden is located near the western end of the terminal moraine of Long Island. This moraine was deposited at the southern edge of the continental glacier that occupied the northern part of North America, during

the last Ice Age. The southward-moving ice picked up and carried along innumerable boulders derived from rock ledges in various localities north of what is now Long Island. During their journey, these boulders were rounded and polished and, in some cases, marked with striations that still persist. Twenty-eight of these boulders have had their lithological composition carefully determined and compared with that of rock ledges to the north. By this study it has been possible to determine, with a fair degree of accuracy, the approximate places from which the boulders now in the Botanic Garden were derived. Bronze tablets, given by President Edward C. Blum, of the Board of Trustees, have been placed on these boulders, telling their composition and probable place of origin, and stating that they were brought to the Garden by the continental ice-sheet during the glacial period.

A similar bronze tablet is mounted on a boulder at the foot of Boulder Hill (which takes its name from the large glacial erratic on its summit). The inscription reads, "Boulder Hill and the entire northern portion of the Botanic Garden are part of the terminal glacial moraine extending from The Narrows to Montauk Point. This tablet was given in 1932 by the Boys' and Girls' Club of the Brooklyn Botanic Garden."

Guide No. 7, *The story of our boulders,* has been prepared for the uses of classes in geography or geology, or others who may be interested, and may be obtained at the Information Desk and Entrance Gates. Arrangements may be made in advance for docents to conduct classes who wish to study these labelled boulders.

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GENERAL INFORMATION

Membership.—All persons who are interested in the objects and maintenance of the Brooklyn Botanic Garden are eligible to membership. Members enjoy special privileges. Annual Membership, $10 yearly; Sustaining Membership, $25 yearly; Life Membership, $500. Full information concerning membership may be had by addressing *The Director, Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, N. Y.* Telephone, Prospect 9-6173.

The Botanic Garden is open free to the public daily from 8 a.m. until dusk; on Sundays and Holidays it is open at 10 a.m.

Entrances.—On Flatbush Avenue, near Empire Boulevard and near Mt. Prospect Reservoir; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

The street entrance to the Laboratory Building is at 1000 Washington Avenue, opposite Crown Street.

To Assist Members and others in studying the collections the services of a docent may be obtained. This service is free of charge to *members of the Botanic Garden;* to others there is a charge of 50 cents per person. Arrangements must be made by application to the Curator of Public Instruction at least one day in advance. No parties of less than six adults will be conducted.

To Reach the Garden take Broadway (B.M.T.) Subway to Prospect Park Station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, or Tompkins Avenue trolley to Washington Avenue; St. John's Place trolley to Sterling Place and Washington Avenue; Union Street or Vanderbilt Avenue trolley to Prospect Park Plaza and Union Street. By Automobile from points on Long Island take Eastern Parkway west and turn left at Washington Avenue; from Manhattan, take Manhattan Bridge, follow Flatbush Avenue Extension and Flatbush Avenue to Eastern Parkway, turn left following Parkway to Washington Avenue; then turn right.

BROOKLYN BOTANIC GARDEN
PUBLICATIONS

RECORD. Established, January, 1912. An administrative periodical issued quarterly (1912–1928); bimonthly (1929–1932); quarterly (1933–). Contains among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, guides, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others $1.00 a year. Circulates in 59 countries.

MEMOIRS. Established, July, 1918. Published irregularly. Circulates in 47 countries.

Volume I. *Dedication Papers:* comprising 33 scientific papers presented at the dedication of the laboratory building and plant houses, April 19–21, 1917. 521 pages. Price $3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. By Norman Taylor, June 11, 1923. 108 pages. Price $1.00, plus postage.

Volume III. Vegetation of Mount Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor, June 10, 1927. 151 pages. Price $1.60.

CONTRIBUTIONS. Established, April 1, 1911. Papers originally published in periodicals, reissued as "separates," without change of paging, and numbered consecutively. Twenty-five numbers constitute one volume. Price 25 cents each, $5.00 a volume. Circulates in 34 countries.

63. Inheritance of resistance to loose and covered smut in a hybrid of Early Gothland and Victor oats. 10 pages. 1932.

64. Inheritance of resistance to loose and covered smut in hybrids of Hull-less with Early Gothland and Monarch oats. 28 pages. 1932.

65. Monographic studies in the genus Eleocharis—II. 34 pages. 1932.

66. Inheritance of resistance to loose and covered smut in hybrids of Black Mesdag with Hull-less, Silvermine, and Early Champion oats. 14 pages. 1934.

67. Inheritance of resistance to loose smut and covered smut in some oat hybrids. 11 pages. 1934.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each. Circulates in 28 countries.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication. Issued as numbers of the RECORD; see above.

Guide No. 5. The Rock Garden. 28 illustrations. Price, 35 cents. By mail, 40 cents.

Guide No. 6. Japanese potted trees (Hachinoki). 11 illustrations. Price, 35 cents. By mail, 40 cents.

Guide No. 7. The story of our boulders: Glacial geology of the Brooklyn Botanic Garden. 22 illustrations. Price, 35 cents. By mail, 40 cents.

Guide No. 8. The story of fossil plants. 8 illustrations. Price, 35 cents. By mail, 40 cents.

SEED LIST. (*Delectus Seminum*) Established, December, 1914. Since 1925 issued each year in the January number of the RECORD. Circulation includes 160 botanic gardens and institutions located in 40 countries.

AMERICAN JOURNAL OF BOTANY. Established, January, 1914. Published, in coöperation with the BOTANICAL SOCIETY OF AMERICA, monthly, except during August and September. Subscription, $7.00 a year. Circulates in 53 countries.

ECOLOGY. Established, January, 1920. Published quarterly in coöperation with the ECOLOGICAL SOCIETY OF AMERICA. Subscription, $4.00 a year. Circulates in 48 countries.

GENETICS. Established, January, 1916. Bimonthly. Subscription, $6.00 a year. Circulates in 37 countries.